Feasibility Study of a proposed Structural Clay Products Industry in Redevelopment Area A, Northwest Florida

U.S. DEPARTMENT OF COMMERCE / Area Redevelopment Administration

FEASIBILITY STUDY OF A PROPOSED STRUCTURAL CLAY PRODUCTS INDUSTRY IN REDEVELOPMENT AREA A, NORTHWEST FLORIDA

By

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For

U.S. DEPARTMENT OF COMMERCE
John T. Connor, Secretary
Area Redevelopment Administration
William L. Batt, Jr., Administrator

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FOREWORD

The basic responsibility of the Area Redevelopment Administration of the U.S. Department of Commerce is to help revitalize the economies of American communities suffering from chronic unemployment and underemployment.

One way of assisting a community is to determine the kinds and the magnitudes of its economic problems and the possible solutions. ARA helps do this through its Technical Assistance program.

This publication is a product of a technical assistance contract with George Aase and Associates, Inc., Tallahassee, Florida.

The study surveys the presence of clay deposits in the western part of Florida, and suggests that they are of sufficient quality to justify a plant to process bricks and other clay products. The conclusions and recommendations have general, broader applicability to any area which has deposits of clay suitable for a clay products industry.

William L. Batt, Jr., Administrator
Area Redevelopment Administration

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FEASIBILITY STUDY OF A PROPOSED STRUCTURAL CLAY PRODUCTS INDUSTRY IN REDEVELOPMENT AREA A, NORTHWEST FLORIDA

S U M M A R Y   O F   R E P O R T

For many years the presence of clay deposits, thought to be suitable for commercial manufacture of bricks and other clay products, has been known in the western part of Florida. A lack of detailed information on quality and extent of the deposits, and, until recent years, the lack of a source of natural gas or other economical fuel, has been a deterrent to the commercial utilization of the clay resources of northwest Florida.

In recent years, local citizens have attempted to aid in the development of a clay products industry and sought the aid of the Florida Development Commission and the U. S. Area Redevelopment Administration. As a result of these efforts a contract was negotiated to provide technical assistance in the form of a feasibility study of a clay products industry based on the raw materials present along the banks of the Apalachicola River in Liberty and Calhoun Counties, Florida.

The study, which was initiated in June 1963 was to encompass detailed investigations of markets, raw materials, manufacturing processes and equipment and other factors influencing the feasibility of the proposed industry.

An investigation of markets for clay products initially included bricks, drain tile, structural tile, quarry or floor tile and lightweight aggregate. It was determined that markets existed - in the area which could be served by a west Florida plant - for common building bricks and, to a minor extent for drainage tile. A total market consumption of 100,000,000 bricks per year was indicated and it was considered that a plant located in west Florida could reasonable expect to capture approximately thirty-five percent of that market. A plant capable of producing 35,000,000 bricks per year is somewhat larger than the average size of brick plants in the U. S. and therefore, of sufficient capacity for economic operation.

A preliminary program of drilling, sampling and testing of the clay deposits in the area indicated several possible deposits of sufficient extent and quality to permit commercial production of clay. Laboratory tests of the clay indicated that commercially acceptable brick and drain tile could be made in west Florida. In addition to the favorable physical characteristics of the deposits tested, they also possessed certain location advantages with respect to proximity to water transportation - a necessary consideration for full realization of the market potential.

Preliminary plant designs and cost estimates were developed for the purpose of determining production costs and overall economic feasibility of the proposed industry. It was determined that the market potential for drain tile was insufficient to warrant the inclusion of tile producing facilities in the plant, but that bricks could be produced at a competitive price which should allow for a profitable return on invested capital.

FEASIBILITY STUDY OF A PROPOSED STRUCTURAL CLAY PRODUCTS INDUSTRY IN REDEVELOPMENT AREA A, NORTHWEST FLORIDA

GENERAL INTRODUCTION

Authorization

This report was authorized by contract No. Cc-6028, between the U.S. Department of Commerce, Area Redevelopment Administration, and George Aase and Associates, Inc., dated June 14, 1963. The present report is a comprehensive study of the feasibility of establishing a structural clay products industry in west Florida.

Area of Study

Redevelopment Area A is located in west Florida and comprises all of Franklin, Liberty, Calhoun, Jackson, Holmes, Washington, and Walton (except for Eglin Air Force Base) Counties (Figure 1). Areas in which raw materials suitable for commercial manufacture of clay products are known to exist are essentially limited to Liberty and Calhoun Counties.

Purpose of Study

The purpose of this study is to determine the feasibility of establishing a structural clay products industry in Redevelopment Area A.

Redevelopment Area A, consisting of the seven counties mentioned above, was designated as a redevelopment area under Public Law 87-27, the Area Redevelopment Act, which was signed into law by President John F. Kennedy in May, 1961. Under section 11 of that act, the Area Redevelopment Administration is authorized to provide technical assistance funds to conduct research programs aimed at encouraging the utilization of the natural resources of designated redevelopment areas.

Throughout the early history of northwest Florida, bricks were manufactured for local use at numerous sites in the area. Raw materials were obtained from small scattered clay deposits. Most of these small operations produced brick by burning clay in small, wood-fired kilns, with the finished product varying considerably in size and quality. Competition from larger and more modern plants forced most of these small plants out of business by the 1920's and none are now in operation in Florida.

At the present time, only two clay brick plants are operating in the state; one at Barth, Florida (north of Pensacola), and the other, a non-commercial, state-owned plant, at the Apalachee

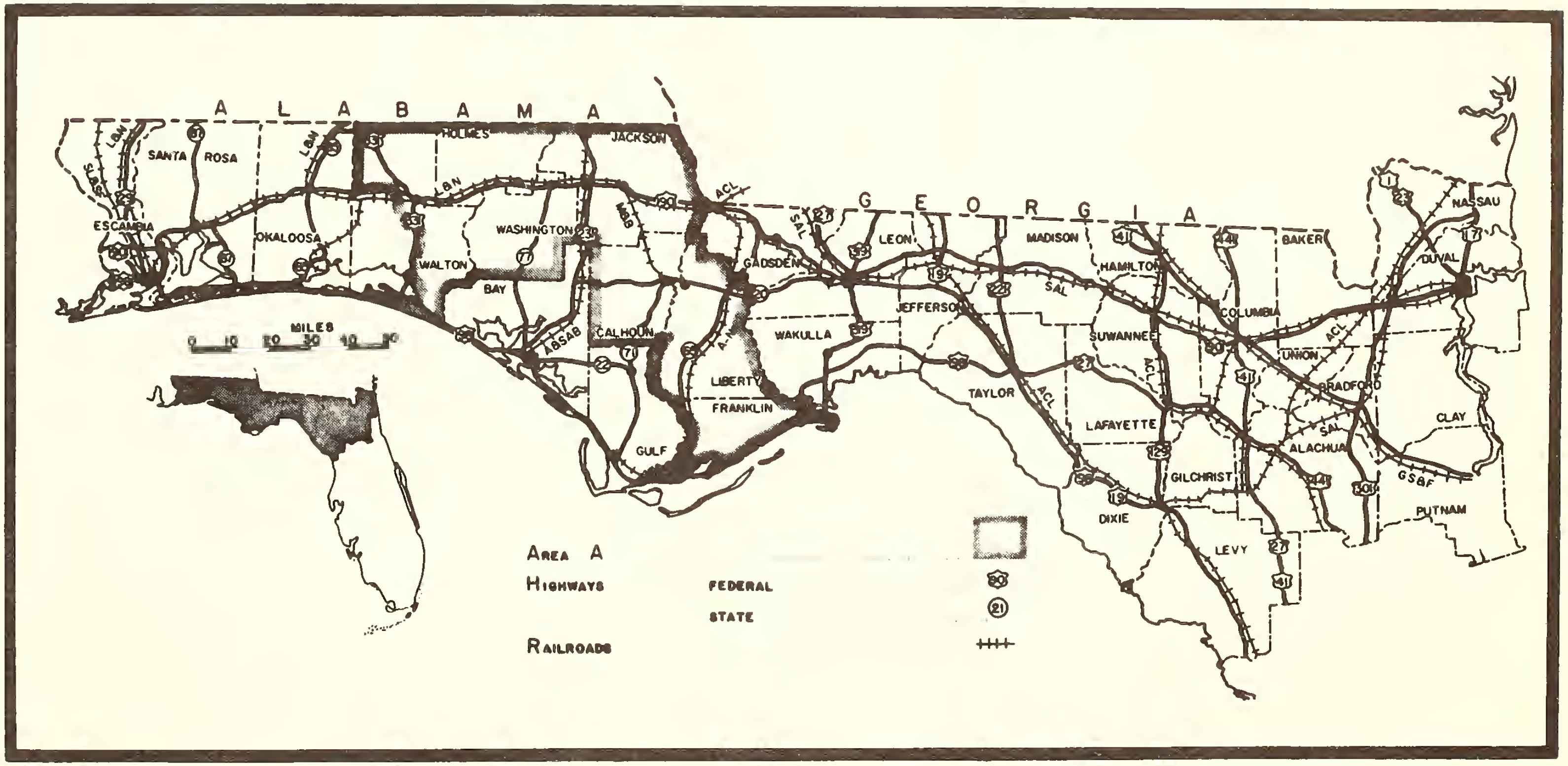


Figure 1   North Florida Showing Location of Redevelopment Area A

Correctional Institute at Chattahoochee. Since the only commercial production is in the extreme western part of the state, most of the Florida market is supplied with bricks and other clay products by plants located outside of the state, primarily in Georgia and Alabama. Clay products, including specialties of various kinds, are shipped into Florida from such distant points as Illinois, Ohio, Arkansas, Kentucky, Texas, Mississippi, and North Carolina.

The only known clay deposits in northwest Florida of sufficient extent and high enough quality to supply a modern clay products plant are found near the banks of the Apalachicola River in Liberty County and Calhoun County. No attempt has yet been made to produce clay products commercially from these deposits. Until recently, there has been no adequate source of fuel available at a low enough cost to permit the utilization of modern manufacturing methods. Another deterrent has been the lack of detailed data on the location and quality of the deposits, and even at this date there is little published information available.

A natural gas line serving northwest Florida was completed in 1958, and recent information on the quality and extent of clays substantiates earlier beliefs that the deposits are suitable for commercial development. These facts, combined with the long distances and expensive transportation involved in supplying Florida markets with clay products strongly indicates the desirability of investigating the feasibility of establishing a clay products industry in northwest Florida.

Local interests sought the aid of the Florida Development Commission in gathering factual information which would lead to the establishment of new industry in the area. The compilation of the detailed information needed, however, was beyond the resources of these groups, and funds were sought from the Area Redevelopment Administration for technical assistance. As a result of the combined efforts of these agencies, a contract for technical assistance was negotiated between the Area Redevelopment Administration and George Aase and Associates, Inc.

Scope of Study

The overall investigation to be performed under the above mentioned contract is intended to accomplish the following objectives:

1. Consolidate available data having a bearing upon the feasibility of the project.

2. Collect additional data needed to determine the feasibility of the project.

3. Present all data, together with a complete scientific and economic evaluation of the project, in the form of a report which can be used by local development authorities and potential investors as a basis for the establishment of new industry and creation a new jobs in the area.

This report presents the findings of the work completed under Phase I of the contract, market and economic research; Phase II, preliminary sampling and testing of raw materials; and Phase III, equipment and manufacturing studies. The original concept of the study grew out of existing information indicating that bricks, equalling or exceeding specifications of the Americal Society for Testing Materials, could be manufactured from the raw materials found in Redevelopment Area A. In addition to bricks, the study contains an analysis of the markets for other products of similar manufacturing characteristics, such as structural (hollow) tile, drainage tile, quarry or floor tile, and lightweight aggregate.

It is understood that the findings of these studies will be made available to all potential investors who might be interested in establishing such industries in the area. The investor will, of course, be influenced in his final decision by his own experience, and by the outcome of negotiations for the purchase of fuel, power, land and raw materials, and manufacturing equipment.

Because of these important uncertainties, the findings of this report have in part been based on assumptions of policy and decision which seemed most logical under the circumstances. The report is therefore not intended to arrive conclusively at a final solution to all of the problems involved and decisions to be made in establishing the industry but rather to determine the feasibility of establishing the industry and to furnish the investor with carefully analyzed factual data to provide a sound basis for exercising his own judgement in the matter.

The findings and conclusions presented in this report are the responsibility of George Aase and Associates, Inc., Tallahassee, Florida.

PART I MARKET ANALYSIS

CHARACTERISTICS, TYPES AND USES OF STRUCTURAL CLAY PRODUCTS

Definition

The term "structural clay products" generally includes various types of brick, hollow or structural tile of all types, lightweight aggregate, and certain decorative as well as structural clay products such as ceramic veneer, architectural terra cotta and ornamental sculpture. Although not technically a structural product, drainage tile was also included, for the purpose of this report only, among the products covered by this study because of its similar physical properties and manufacturing characteristics.

Structural clay products, with the exception of lightweight aggregate, are made by molding or otherwise forming wet clay into the desired shape and heating or "firing" the product to temperatures of up to 2400° F. Lightweight aggregate is produced by heating pellets of clay in a rotary kiln until the clay is fused into an expanded cellular mass. The cindery material is then allowed to cool and is crushed and screened for use as a concrete aggregate.

Distinctive Properties of Clay Products

Several characteristics of clay products contribute to their desirability as construction materials. Most important of these are: (1) the load bearing characteristics of brick and structural tile, (2) low upkeep and maintenance costs, (3) durability and long life, (4) fire resistance, and (5) the appearance or esthetic qualities of masonry construction.

In addition to the above properties, which are important in masonry wall construction, clay products such as drain tile and lightweight aggregate possess additional qualities that have made these products important in the construction industry.

Clay drain tile has the advantage of being one of the lowest-cost materials available for use in septic system drain fields and for other uses where a non-jointed drainage line is required. It is highly resistant to attach by sewage effluent, and is now being manufactured with copper wire bonded to the inside of the tile for the purpose of preventing root damage by inhibiting plant growth inside drainage lines.

Lightweight concrete aggregates made of expanded clay permit the reduction of weight of concrete from approximately 150 pounds per cubic foot to 50 to 90 pounds per cubic foot without a serious reduction in strength. The resulting concrete also possesses superior insulating qualities.

Principal Types and Uses of Products Now in Use

The principal types of structural clay products are: bricks, structural or hollow tile, quarry or floor tile, and lightweight

aggregate. As previously mentioned, this report will also include drainage tile, since its physical specifications are similar to bricks and structural tile and because it is a common construction material in the geographic area covered by this study.

Building bricks are generally classified as either "common" or "face" bricks. The term face brick may be used to refer to a brick made to relatively close dimensional tolerance and of a uniform color, texture and finish. A face brick is used for exterior wall construction, and probably the most important single characteristic of such a brick, especially in residential and small commercial construction, is its appearance. Bricks are made in several standard sizes, as shown by the table below (Structural Clay Products Institute, 1961).

TABLE 1

NOMINAL MODULAR SIZES OF BRICK

	Thickness (Inches)	Height (Inches)	Length (Inches)
Conventional Brick	4	2-2/3	8
Roman Brick	4	2	12
Norman Brick	4	2-2/3	12
Engineers Brick	4	3-1/5	8
Economy Brick	4	4	8
Jumbo Brick	4	4	12
Double Brick	4	5-1/3	8
Triple Brick	4	5-1/3	12
"SCR Brick"*	6	2-2/3	12

* Reg. U.S. Patent Off., Pat. Pend., Structural Clay Products Research Foundation

Note: Nominal size of a masonry unit includes the thickness of the mortar joint with which the unit is designed to be laid.

Probably the most commonly used brick in Florida construction is the conventional brick. Roman brick is manufactured in Alabama and is also used frequently in Florida.

Perhaps the most important, and most widely varying characteristics of bricks used for residential construction are those features contributing to the external appearance of the brick - color and texture. Although ninety-nine percent of the brick production of the United States is classified as various shades of red, buff, and cream, at least 182 separate color names have been applied to bricks available in the U. S. Glazed bricks may, of course, be made

in nearly any color. Several common surface textures are available in building bricks. These textures are described as scored, strippled, hammered, sandstruck and waterstruck - however, these are general terms which do not adequately describe textures, and, since no system of textural classification has been devised, textures are usually described and selected by reference to a sample brick (Structural Clay Products Institute, 1960).

The properties or characteristics of a high quality brick vary widely according to the intended use of the brick. For residential structures and other buildings where great load-bearing characteristics are not necessary, the appearance of the brick may outweigh all other considerations.

A high quality building brick should have a modulus of rupture of 600 pounds per square inch or a minimum compressive strength of 3000 pounds per square inch.

In northern climates, resistance to freezing and thawing is important, but in the market area served by a plant located in northwest Florida this characteristic need not be considered.

Absorption of water is indicative of how well the mortar will bond the brick, although this property is not usually included in required specifications. Bricks with high rates of absorption may require soaking in water prior to laying of the brick.

The dimensional tolerances of brick should be held to within $\pm$ 3 percent of the specified dimension.

Structural or hollow tile is made in two general types: end-construction, in which the principal stress is received parallel to the axes of the cells, and side-construction, which is designed to receive the principal stress at right angles to the cells. Both types are made with load-bearing and non-load bearing characteristics. Structural tile is available in a wide variety of standard sizes and a variety of finishes. It may be used to comprise an entire wall or it may be used as a backing for brick or other facing. Structural tile has been widely used in brick and tile loadbearing walls for multiplestory buildings.

Quarry or floor tile is used primarily in residential construction for surfacing kitchen or bathroom floors and enclosed porches or patios. It is commonly made in 4-1/2 or 6 inch squares about one inch thick, and may be produced with an artifical coloring or pattern. All quarry tile used in Florida is shipped into the state from distant sources. Similar products, such as architectural terra cotta, glazed tile, and specially shaped products which are used for decorative as well as structural purposes, are generally made to order and for this reason will not be considered in this report.

Drainage tile is made in a variety of diameters and lengths, the most common being four inches in diameter and twelve inches in length. It is used in drainage lines for the purpose of collecting and diverting excess moisture, or for removal of water or sewage from a collection point to the drain field where it is absorbed into the ground. The most common use in Florida is in septic system drain

fields. Sewage effluent flows from the septic tank, through a line of sealed glazed clay pipe, or cast iron pipe to a distribution box where it enters the drainage lines. Tile in the drainage lines is laid in a bed of gravel or other porous material with spaces between each tile to permit the escape of the effluent. No clay drainage tile is produced in Florida and all that is used is shipped from adjacent states.

Lightweight aggregate is a burned clay product used primarily where a reduction in weight without a serious loss of structural strength is required. It is coming into wide use for construction of bridges and in concrete block manufacturing because of its superior insulating qualities. The scarcity of natural aggregate in Florida has also been a factor in its expanding usage in the state. It has probably not yet realized its full market potential because of its high cost and limited availability.

Principal Competing Products

While structural clay products have several very desirable characteristics which may in many cases favor their use, the industry is beset by competition from other products. The lower initial cost and, in some areas, the more ready availability of concrete block, Portland cement, expanded slag, vermiculite, natural aggregate, lumber and wood products, has led to the widespread use of these competing products. The factors influencing and limiting the production and use of clay products will be examined in detail in this report.

PRODUCTION AND USE OF STRUCTURAL CLAY PRODUCTS IN THE UNITED STATES

Importance of the Industry

With a combined value of shipments amounting to $510,473,000 in 1962, the clay construction products industry represents a major element of the national economy. Some important clay products have declined in usage, however, as others have increased, and on the whole the industry has experienced only moderate and sporadic growth during recent years.

A close correlation exists between the fortunes of the clay construction products industry and the building industry as a whole, and both in turn are reflected in the trend of the general economy. These relationships are borne out in the comparison below.

	Gross National Product (Million $)		Value of New Construction (Million $)		Value of Clay Products (Million $)	
	Value	% Change	Value	% Change	Value	% Change
1953	363.2	-----	45,697	-----	347.5	-----
1954	361.2	- 0.5	48,587	+ 6.3	356.7	+ 2.6
1955	397.5	+10.0	52,941	+ 9.0	490.1	+12.5
1956	419.2	+ 5.5	51,794	- 2.2	501.6	+ 2.3
1957	442.8	+ 5.6	51,979	+ 0.4	439.2	-12.4
1958	444.5	+ 0.3	52,505	+ 1.0	452.6	+ 3.0
1959	482.8	+ 8.6	57,304	+ 9.1	521.5	+15.2
1960	504.4	+ 4.5	54,846	- 4.3	487.4	- 6.5
1961	521.2	+ 3.3	57,399	+ 4.7	479.1	- 2.5
1962	553.9	+ 5.9	61,084	+ 6.0	510.5	+ 6.5

Source: Statistical Abstract of the United States

Distribution of the Industry

Distribution of the clay products industry in the United States is influenced by the most favorable combinations of raw material and market locations. Probably as much or more than for any other major construction material, quality of raw material is of extreme importance for the manufacture of clay products. Clay deposits of both suitable quality and adequate size for commercial exploitation are relatively few, although of fairly wide geographical distribution. Because of the high cost of transporting structural clay products, only those deposits within reasonable shipping distance of a market can be profitably developed.

Proximity to markets being all important, the industry has tended to concentrate near the centers of population, where construction activity is sufficeint to create demand for the products. Every state in the union has a clay products industry of some type, but Ohio, Pennsylvania, New York, Virginia, North Carolina, South Carolina, Illinois, Georgia, Alabama, Texas, Tennessee and California are perennially among the major producers.

A notable exception to the general trend of the industry to follow the development of markets is evidenced in the lack of local production to serve rapidly growing central and southern Florida. This is accounted for by the virtual absence of suitable clay deposits in the Florida peninsula.

Data on the National Clay Products Industry

Because of the wide variety of clay construction products manufactured in the United States today, it has been necessary for national data reporting agencies to develop broad categories for statistical purposes. This categorization makes it virtually impossible in some cases to analyze the production and marketing characteristics for individual products. In these instances, the groupings inclusive of

the product of particular interest will be considered as generally representative of the product itself.

Although the clay construction products industry embraces a wide range of finished products - including all types of ceramic and facing tile and accessories - for the background useful to this report primary attention will be given to the several products for which competition is likely to be developed in the northwest Florida area. These have been identified earlier, but are listed below with reference to the classifications devised by data reporting agencies.

From the U. S. Department of Commerce, Bureau of the Census:

(a) brick	- "unglazed brick (building or common and face)"
(b) structural tile	- "structural clay tile (except facing)"
(c) quarry tile	- "clay floor and wall tile and accessories (glazed and unglazed), including quarry tile"
(d) drain tile	- (separate statistics for drain tile have not been reported since 1953.)

From the U. S. Department of the Interior, Bureau of Mines:

(e) lightweight aggregate	- "lightweight aggregate"

Thus, for three of the five identified products - brick, structural tile and lightweight aggregate - data are available in a highly useful form. Analysis of these data throws some interesting light on the trend of these products in the national economic picture.

Production of Structural Clay Products

Brick - Easily the most important of all structural clay products, bricks account for the greatest volume and value in United States production. Despite its importance in the industry, however, and its common acceptance as a construction product, brick production has been essentially static over the past decade, as reflected in the table below.

	Brick Production (1000 units)	Change	% Change
1953	5,873,850	---	---
1954	6,153,193	+ 279,343	+ 4.8
1955	7,790,000	+1,636,807	+26.6
1956	8,085,405	+ 295,405	+ 3.8
1957	6,658,000	-1,427,405	-17.7

	Brick Production (1000 units)	Change	% Change
1958	6,489,000	- 169,000	- 2.5
1959	7,336,000	+ 847,000	+13.1
1960	6,943,000	- 393,000	- 5.4
1961	6,682,000	- 261,000	- 3.8
1962	6,889,000	+ 207,000	+ 3.1

Source: U.S. Bureau of Census, Current Industrial Report

Actual brick production capacity in the United States is not known precisely, but it is estimated at considerably in excess of the 8,085,405,000 peak production reached in 1956. Production is limited not by inadequate plant capacity or raw materials, but by a static market.

Structural Tile - Once a major component of the industry, structural tile has suffered greatly from competition by concrete building block, and has declined sharply in volume produced during recent years.

	Structural Tile (Short Tons)	Change	% Change
1953	990,400	----	----
1954	995,400	+ 5,000	+ .5
1955	934,900	- 60,500	- 6.1
1956	861,600	-133,800	-14.3
1957	687,100	-174,500	-20.3
1958	573,500	-113,600	-16.5
1959	549,300	- 24,200	- 4.2
1960	496,133	- 53,167	- 9.7
1961	478,470	- 17,663	- 3.6
1962	438,987	- 39,483	- 8.3

Source: U.S. Bureau of Census, Current Industrial Reports

It appears likely that this downward trend will continue until this product is of virtual insignificance in the industry.

Quarry Tile - While only of secondary importance in the industry, quarry tile has retained its popularity as a floor material. The following production figures for floor and wall tile may well be representative of quarry tile, which is included.

	Floor and Wall Tile (1000 sq. ft.)	Change	% Change
1953	137,429	----	----
1954	141,066	+ 3,637	+ 2.6
1955	233,001	+91,935	+65.2
1956	245,996	+12,995	+ 5.6
1957	216,552	-29,444	-12.0
1958	221,768	+ 5,216	+ 2.4
1959	258,631	+36,863	+16.6
1960	241,870	-16,761	- 6.5
1961	228,897	-12,973	- 5.4
1962	258,001	+29,104	+12.7

Source: U.S. Bureau of Census, Current Industrial Reports

This upward trend has been one of the most promising signs in the industry, although the volume of quarry tile still has not increased to the point of engendering widespread, local production. The number of plants manufacturing quarry tile is probably no more than 5 percent of the number producing common brick.

Drain Tile - Although separate figures for drain tile production have not been reported for recent years, a generally upward trend was indicated through the year 1953. United States production that year totalled 817,826 tons. It is believed that production may have fallen off considerably since 1953, however, because of the declining use of septic tank sewerage systems.

Lightweight Clay Aggregate - It is probable that lightweight clay aggregate, a relatively new product, has not yet attained its full marketing potential. Figures for miscellaneous clay used for lightweight aggregate production are available from 1953, and illustrate a remarkable upward trend.

	Misc. Clay Used For Lightweight Aggregate (Tons)	Change	% Change
1953	1,166,553	----	----
1954	1,548,550	381,997	+32.74
1955	3,092,583	1,544,033	+99.70
1956	4,087,913	-995,330	+32.18
1957	3,752,455	-335,458	- 8.20
1958	4,456,867	704,412	+18.77
1959	5,270,298	813,431	+18.25
1960	5,504,367	234,069	+ 4.44
1961	6,047,092	542,725	+ 9.58
1962	6,769,912	722,820	+11.95

Source: U.S. Bureau of Mines, Minerals Yearbooks

For areas where expanded clay products can be marketed competitively with other lightweight aggregates, this could develop as o one of the most important items in the clay products line.

Consumption of Structural Clay Products

While the production figures discussed above generally represent the industry's response to the changing national demand for the products in question, consumption figures are actually a measure of the demand. Because the industry is fairly sensitive and flexible, however, production is kept closely in line with the demand, and both are characterized by essentially the same behavior.

Consumption of brick, structural tile and floor and wall tile during the past decade, as represented by actual shipments is indicated in the table below.

	BRICK		STRUCTURAL TILE		FLOOR & WALL TILE	
	Shipments (1000)	Value (1000 $)	Shipments (Tons)	Value (1000 $)	Shipments (M.sq. ft.)	Value (1000 $)
1953	5,771,211	162,752	921,985	11,524	134,375	71,569
1954	6,119,395	177,539	895,284	11,143	139,515	75,932
1955	7,741,000	231,410	928,940	11,732	232,802	128,193
1956	7,381,600	236,349	750,458	9,811	227,369	128,526
1957	6,305,900	205,758	640,695	8,749	211,635	115,543
1958	6,458,800	209,949	542,869	7,709	215,710	119,171
1959	7,728,000	241,385	521,346	7,958	252,545	141,149
1960	6,502,200	223,546	483,174	7,840	232,959	129,524
1961	6,428,600	225,285	475,969	7,404	228,411	124,301
1962	6,913,067	246,457	422,861	6,590	253,104	135,526

Source: U. S. Bureau of Census, Current Industrial Reports

While no complete figures are available for national consumption of drain tile and lightweight clay aggregate, it may reasonably be assumed that consumption of these commodities bears the same general relationship to production as indicated for the three categories of products tabulated below.

	BRICK		STRUCTURAL TILE		FLOOR & WALL TILE	
	Shipments (1000)	% of Production	Shipments (Tons)	% of Production	Shipments (M sq. ft.)	% of Production
1953	5,771,211	98.3	921,985	93.1	134,375	97.8
1954	6,119,395	91.0	895,284	93.9	139,515	98.9
1955	7,741,000	98.0	928,940	99.4	232,802	99.9
1956	7,382,600	91.8	750,458	87.1	227,369	92.4
1957	6,306,900	94.7	640,695	93.2	211,635	97.7
1958	6,439,800	99.6	543,869	94.7	215,710	97.3
1959	7,259,000	98.9	521,346	94.7	252,545	97.6
1960	6,502,200	93.7	488,174	98.4	232,959	96.3
1961	6,428,600	95.9	475,969	99.5	228,411	99.8
1962	6,913,067	100.4	422,861	96.3	253,104	98.1

Source: U. S. Bureau of Census, Current Industrial Reports

Factors Influencing Consumption

As pointed out earlier, consumption of clay products in the United States is intimately tied to the vagaries of the construction industry, which in turn is influenced by the condition of the national economy. This is further borne out in the case of brick by a percentage comparison with the trend of residential construction in the United States. While structural tile, lightweight aggregate and, to a great extent, floor and wall tile have their principal uses in non-residential construction, about 70 percent of the national brick consumption is accounted for by the home building industry.

	New Housing Units Constructed		Value of Residential Construction		Brick Shipments	
	Number	% Change	(Million $)	% Change	(1000)	% Change
1953	1104	---	18,113	---	5,771,211	---
1954	1220	+10.5	20,069	+10.8	6,119,395	+ 6.0
1955	1329	+ 8.9	23,580	+17.5	7,741,000	+26.5
1956	1118	-15.9	21,296	- 9.7	7,382,600	- 4.6
1957	1042	- 5.8	20,310	- 4.6	6,306,900	-14,6
1958	1209	+16.0	21,705	+ 6.9	6,459,800	+ 2.4
1959	1531	+26.6	25,965	+19.6	7,258,000	+12.4
1960	1274	-16.8	23,262	-10.4	6,502,200	-10.4
1961	1327	+ 4.2	23,339	+ .3	6,428,600	- 1.1
1962	1482	+11.6	24,833	+ 6.1	6,913,067	+ 7.5

Source: Statistical Abstract of the United States

Transportation of Clay Products

Because transportation has such an important bearing on the marketing side of the clay products industry, several aspects of this subject should be noted.

Bricks and other clay products are extremely heavy, and high freight costs are incurred for shipping even short distances. The high freight-cost to product-value ratio effectively limits the economic shipping radius for clay products to about 500 miles by rail and 250 miles by truck. The average of shipments in most cases would probably be somewhat less than these distances. Only in the case of special products or shipments for a special purpose can longer hauls be justified. At these distances, freight costs would represent about half of the total cost at the point of delivery, and only under unusual circumstances could the product stand the competition from alternative products available in the locality.

Because of their versatility and susceptibility to closer control, trucks are the preferred method of transportation employed by the industry. Specially designed trailers have been developed to facilitate loading and unloading, and once loaded they can be delivered directly to the construction site or other specific location without further handling. Less-than-capacity lots can be carried with greater

efficiency and economy by trucks than by rail car, and the flexibility of trucking permits ready delivery by any route and on any time schedule. Many producers have gone to the exclusive use of contract haulers or company-owned trucks in preference to common carriers.

The following figures, weighted on the basis of the number of producers reporting rather than the volume of clay products shipped, were developed in 1961, by a survey conducted by a leading trade journal.

	United States Average
Percent of total shipments shipped by rail	16.5*
Percent of total shipments shipped by truck	76.0*
Percent of total shipments picked up by user	13.9*
Percent of truck shipments shipped by contract hauler	29.6
Percent of truck shipments shipped by company-owned trucks	40.1
Percent having exclusive use of contract hauler	26.8

* Excess over 100% not explained - probably due to multiple-response reporting procedures

Imports and Exports

Imports and exports of structural clay products play only a minor role in the economics of the industry. Annual imports and exports of these products total less than one percent of the U.S. annual production. In 1962, imports totalled 11,486,000 brick equivalents with a value of $428,707.00. Over 90 percent of imports originated in Canada and Mexico with minor percentages shipped from Denmark and Italy.

In 1962, the U. S. exported a total of 29,937,000 brick equivalents in the form of building and paving bricks and structural tile. These shipments had a value of $2,704,682.00. They were shipped primarily to Canada and Mexico, with less than ten percent to destinations in fourteen foreign countries in Central and South America, Europe and the Middle East (U.S. Bureau of Census, 1962 Annuals, U. S. Imports, U. S. Exports). Foreign import and export figures from Florida ports are available only for the broad classification of brick (all types) and tile (all types) for the year 1961, when a Florida Customs District was created. The total exports were valued at $132,000.00 with a weight of only 595 tons. Imports totaled 5,549 tons with a value of $927,000.00.

It is believed that none of the exported products were manufactured in Florida, and it is unlikely that a large percentage of the imports consisted of common structural materials such as brick

or structural tile. Most of the imports were probably various types of specialty products including special types of building brick and ornamental clay products. The small quantities of brick and tile exported from Florida ports probably were manufactured in Georgia, Alabama or elsewhere, and transported to Florida ports for export primarily to Central and South America.

REGIONAL PRODUCTION AND MARKETING CHARACTERISTICS

Regional Identity

Because structural clay products for the most part are not shipped great distances and because production is rather widespread in the United States, it is possible to identify regional marketing patterns. A region in this sense would be an area the radius of which would approximate the optimum economic marketing distance from a given plant, and within which a reasonable balance of production and consumption exists. Obviously, there can be no perfect examples of such a region, but, in the case of the area presently under study, a logical regional unit is made up of the three states of Alabama, Georgia and Florida.

This three-state area perhaps lends itself better to the regional identity than any other area of the country. Georgia and Alabama are both surplus producers of structural clay products, but much of this surplus is marketed in Florida, where a great supply deficit exists. Conversely, an overwhelming majority of the structural clay products consumed in the three-state area is produced in those states. The result is little net import and export. There is a significant amount of shipments out of Georgia and Alabama to the north and northwest, but these are still minor compared to the total volume. With the exception of specialty products, probably 95 percent of the structural clay products used in the three-state area comes from within.

With this more-or-less self-contained supply and demand situation, this three-state region bears closer analysis as the market entity in which a new structural clay products industry in northwest Florida will have to function.

Production in the Three-State Region

Volume and national standing - Because of the availability of suitable clay deposits throughout most of Georgia and Alabama, these two states have been able to develop significant clay products industries. Florida, on the other hand, has little suitable clay and, consequently, virtually no dependent industry. These facts color the regional picture to the extent that, while Georgia and Alabama would each rank high in production as individual states, the region as a whole rates something less than an average standing in the national picture.

Although detailed statistics are not available to establish the

exact position of the industry on a regional basis, published figures for brick and structural tile production and miscellaneous clay shipments indicate that Georgia, Alabama and Florida together account for about eight to ten percent of national clay products production. The relatively low position in the national production is indicated by the fact that the region has slightly more than fourteen percent of the United States population and is growing at a rate 64% faster than the national average. It is interesting to note that the region produces, on an average, about twice as much of the nation's structural tile as it does of its brick. Since the structural tile industry in the United States has dwindled to the point where it uses less than five percent of the clay used by the brick industry, the prominent position of the region in the tile production picture has little consequence when the clay products industry as a whole is considered.

The figures below show production trends for the three-state region over the past decade. The position of the region in the national production picture is indicated by percentage.

TABLE 2
REGIONAL PRODUCTION DATA

	Misc. Clay Sold or Used (1000 Tons)	% of U.S.	Brick Production (1000 Units)	% of U.S.	Structural Tile Production (Tons)	% of U.S.
1953	2,300	8.1	512,442	8.7	200,540	24.3
1954	2,590	8.6	556,721	9.0	211,157	22.1
1955	2,690	8.6	700,000*	8.7	N.A.	----
1956	2,765	8.1	665,000*	8.2	N.A.	----
1957	2,230	7.5	547,014	8.2	134,628	19.6
1958	2,710	8.8	598,961	9.2	115,757	24.2
1959	3,100	8.8	714,254	9.7	131,088	23.8
1960	3,130	9.1	642,853	9.2	126,093	25.4
1961	3,120	9.1	646,156	9.7	113,743	23.8
1962	2,824	8.2	721,264	10.7	63,262	14.4

* Constructed Figure

Source: U. S. Bureau of Mines, Minerals Yearbooks

Perhaps a better indication of regional standing in United States production is provided by the following table, which consolidates brick and structural tile on a tonnage basis.

TABLE 3
BRICK AND STRUCTURAL TILE PRODUCTION*

	U.S. Production (Tons)	Regional Production (Tons)	Regional % of U.S.
1953	12,738,100	1,225,424	9.6
1954	13,301,786	1,324,519	9.9
1955	16,514,900	----	---
1956	17,032,410	----	---
1957	14,003,100	1,228,656	8.6
1958	13,541,500	1,313,697	9.6
1959	15,221,300	1,559,596	12.4
1960	14,382,133	1,411,796	9.8
1961	13,842,470	1,406,055	10.1
1962	14,216,987	1,505,780	10.5

* Equated on basis of 1 brick = 4 pounds

Source: U. S. Bureau of Census, Current Industrial Reports

It is significant that, although production of structural tile - of such relative importance in this region - has declined sharply at both national and regional levels, the region has experienced a slight overall increase in its share of United States production of brick and tile combined. This is probably attributable to the growing market within the region, which - although primarily because of Florida - is increasing in population somewhat faster than the United States as a whole.

Unfortunately, no figures are available to reflect regional production of drain tile, floor and wall tile and lightweight aggregate. Superficial analysis of figures reported for a broader regional breakdown by the U. S. Department of Commerce indicates that floor and wall tile production in the southeastern United States is very limited. Similarly, the distribution of production facilities in the United States leads to the conclusion that lightweight clay aggregate production in the region is relatively minor. On the other hand, clay drain tile is a commodity in considerable demand in this part of the country, and its production in the region is significant. Whatever the production rates of other clay products, however, they would effect relatively little change in the national ranking of the region established by the brick and tile figures discussed above.

Production facilities - Figure 2 shows the geographic distribution of structural clay products plants, by type of principal

product, in the three-state region. Production facilities are fairly well scattered throughout Alabama and northern Georgia, but are strikingly absent in Florida and the adjacent parts of Georgia. In a number of plants, it can be seen that brick, structural tile and drain tile are fairly common. Of particular importance in the marketing patterns in the southern part of the region is the tight line of plants stretching from Fairhope, Alabama, on the southwest, up through Montgomery, Alabama and Columbus, Macon and Milledgeville, Georgia, to Augusta, Georgia, on the northeast. This line marks the southern flank of major producers in the three-state region, and to a great extent dominates the growing market to the south and southeast, including virtually all of Florida.

It is significant to note that there are only two producers of lightweight clay aggregate in the region, and no plants specializing in quarry tile or similar items. One of the lightweight aggregate plants is at Rockmart, Georgia, northwest of Atlanta, and the other is at Green Cove Springs, Florida, south of Jacksonville.

A tabular summary of structural clay products plants in the three-state region by principal type of product, is provided below.

Common Brick

- Barth, Florida
- Plant City, Florida (under construction)
- Augusta, Georgia (2)
- Columbus, Georgia (2)
- Macon, Georgia (2)
- Thomasville, Georgia
- Atlanta, Georgia (2)
- Rome, Georgia
- Calhoun, Georgia
- Lafayette, Georgia
- Dalton, Georgia
- Fairhope, Alabama
- Montgomery, Alabama
- Birmingham, Alabama (4)
- Newton, Alabama
- Gadsden, Alabama
- Brewton, Alabama
- Phenix City, Alabama
- Piedmont, Alabama
- Cordova, Alabama
- Decatur, Alabama
- Huntsville, Alabama

Structural Tile

- Augusta, Georgia (2)
- Macon, Georgia
- Columbus, Georgia

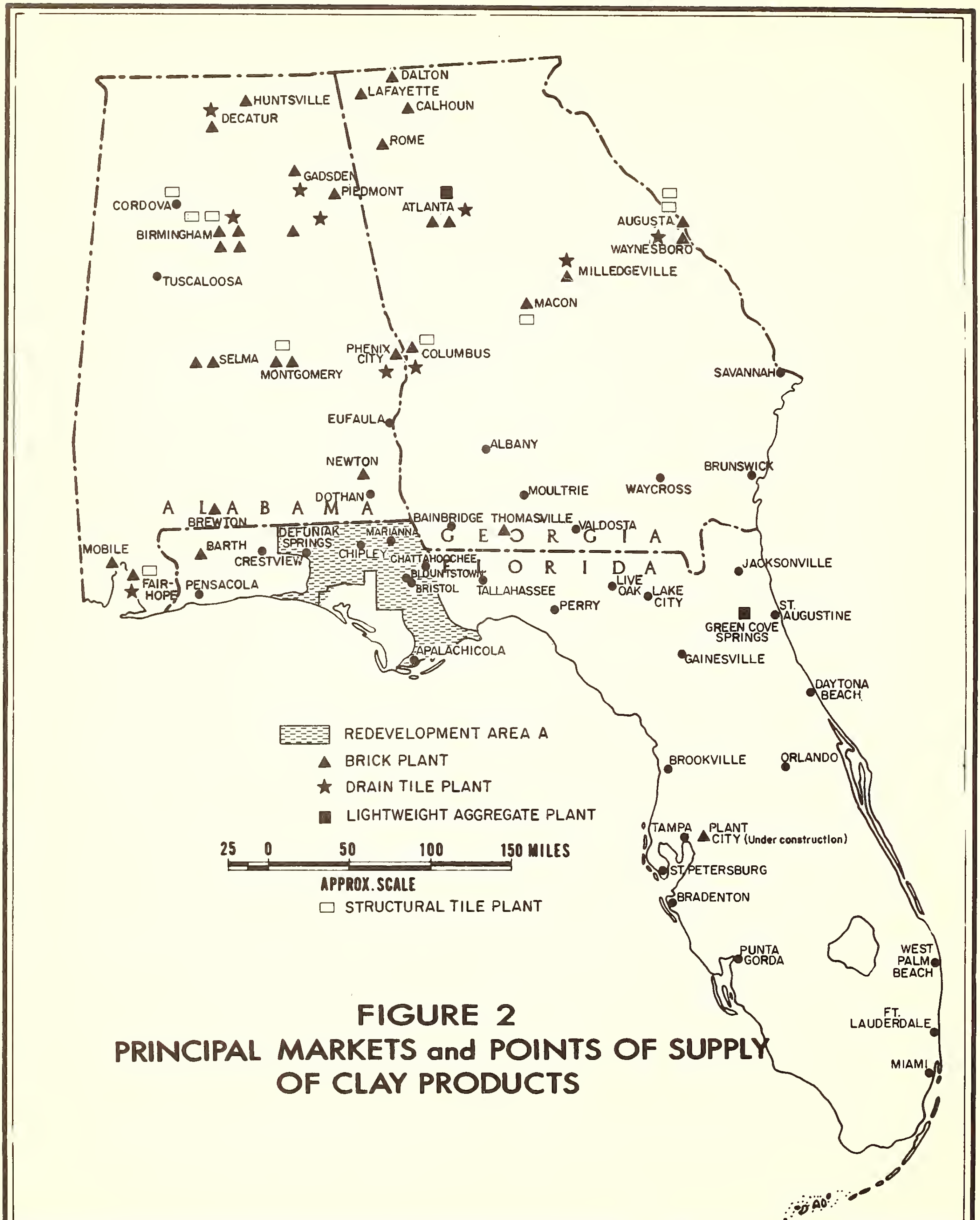


FIGURE 2
PRINCIPAL MARKETS and POINTS OF SUPPLY OF CLAY PRODUCTS

Structural Tile - continued
Fairhope, Alabama
Montgomery, Alabama
Bessemer, Alabama
Birmingham, Alabama
Cordova, Alabama

Drainage Tile
Atlanta, Georgia
Harlem, Georgia
Milledgeville, Georgia
Augusta, Georgia
Columbus, Georgia
Phenix City, Alabama
Fairhope, Alabama
Birmingham, Alabama
Gadsden, Alabama
Anniston, Alabama
Decatur, Alabama

Lightweight Aggregate
Green Cove Springs, Florida
Rockmart, Georgia

Factors influencing distribution - On the regional level, the limiting effect of raw materials availability on the distribution of structural clay products plants becomes even more apparent. Whereas a cursory study of the national clay products industry would justify a conclusion that producing facilities are located in relatively close proximity to all major markets and are fairly well distributed throughout the country, analysis of the regional picture immediately points up the glaring imbalance in plant distribution.

The acute deficiency of commercially usable clay deposits in peninsula Florida has in effect deprived that rapidly growing area of major use of clay structural materials. Local production - although possible with imported raw materials - has been impractical, and the high transportation costs incurred in the shipment of finished products 400-600 miles have made it virtually impossible to compete successfully with concrete and other alternative products that can be supplied at lower cost.

In the face of this situation, it is interesting to note the construction of a brick plant now in progress at Plant City, Florida, immediately east of Tampa. It is indicated that this plant will obtain its raw materials from outside the state. Shipment of raw materials to an area of high market potential does have an advantage over shipment of the finished product an equal distance in that there is only the single destination for large volume shipments. Also, because the raw materials are of lower value than the finished product, it will be economically more feasible to stockpile quantities, reducing the dependence on closely scheduled transportation. Still, a

venture of this nature is the exception to a long-established rule, and at this point can be regarded only as a high-risk business experiment. If it proves successful, it obviously will be followed by other such ventures.

The reluctance of the industry to ship raw materials to market-based plants, however, is influenced also by factors other than transportation costs. Some clays contain so much moisture that shipping of raw materials is impractical. Other clays may lose so much moisture during shipment that additional treatment is necessary at the plant. In special cases, however, such as the manufacture of sewer pipe, where raw materials are usually blended and come to the plant from more than one source of supply, and where shipment of the finished product is frequently more difficult and costly than shipment of the raw material, transportation of the raw material to plant sites near the markets is becoming more common. A good example of this is the vitrified clay sewer pipe plant recently constructed at Ocala, Florida, by the U. S. Concrete Pipe Company. Raw materials for this plant are shipped several hundred miles, primarily from sources in Georgia.

Consumption in the Three-State Region

Consumption of structural clay products varies greatly within the region. For Alabama, Georgia and northern Florida, the use rate is near - and possibly slightly in excess of - the national average. In extreme southern Florida, on the other hand, the use of structural clay products is virtually unknown. While lack of reported data makes it difficult to estimate consumption for the three-state region, somewhere in the vicinity of 500 to 600 million bricks are used annually, and probably 50 to 60 thousand tons of structural clay tile.

It is true that only a small part of regional production of clay products is shipped outside the region, and even fewer such products are brought in. Thus, the region is a net exporter, and its internal consumption is something less than its total shipments. Figures for total shipments correspond very closely to production figures in a parallel to the national pattern. The trend in total shipments over the past decade for brick and structural tile is reflected in the table below.

TABLE 4
REGIONAL BRICK AND TILE SHIPMENTS

	Regional Brick Shipments (1000 Units)	% of Production	Regional Structural Tile Shipments (Tons)	% of Production
1953	508,092	97.1	194,483	96.9
1954	562,219	100.9	196,422	93.0
1955	704,000*	100.1	N.A.	----
1956	630,000*	94.7	N.A.	----

TABLE 4 (continued)

	Regional Brick Shipments (1000 Units)	% of Production	Regional Structural Tile Shipments (Tons)	% of Production
1957	531,855	92.6	126,300	93.8
1958	613,263	100.2	112,475	97.1
1959	697,411	97.6	119,645	91.2
1960	613,954	95.5	116,921	91.9
1961	627,739	97.0	108,280	95.1
1962	754,497	104.3	63,324	99.9

* Constructed Figure

Source: U. S. Bureau of Census, Current Industrial Reports

An indication of the regional in-shipment and out-shipment picture - and, therefore, regional consumption - for the two major structural clay products can obtained from analysis of the U. S. Interstate Commerce Commission Waybill Statistics for commodities shipped by rail. While it is true that only a small part of total shipments - probably 20-25 percent - are carried by rail, nevertheless, these rail shipments would cover more of the longer hauls involved in shipping outside the three-state region. This fact would tend to increase the representativeness of rail statistics for all out-of-region shipments.

There are several interesting conclusions suggested by the Waybill Statistics over the past decade. First, they show that, on the average, 71 percent of sampled rail shipments of brick originating in the region have destinations also within the region. Since truck hauls would average probably something less than half the distance of these rail hauls, it follows that an even larger percentage of regional truck shipments are bound for other points within the region. Assuming that truck shipments represented eighty percent of total brick shipments, and that eighty percent of total truck shipments stayed within the region as opposed to the 71 percent for rail, then theoretically 78.2 percent of total brick shipments would stay within the region.

Since out-of-region shipments are already accounted for, the addition of into-region shipments would produce a figure for regional consumption. The Waybill Statistics also show that over the past decade rail shipments of brick into the region from points of origin outside have averaged 20 percent of rail shipments originating within the region and bound for points outside. This figure would probably be considerably higher for truck shipments, inasmuch as the surrounding states of Mississippi, Tennessee, North Carolina and South Carolina all have a significant clay products industry with which to reciprocate inter-state trade on a

local truck-haul basis. Assuming that this figure were 50 percent for truck shipments, then theoretically an amount equal to 9.16 percent of total regional brick shipments would be marketed in the region from production outside. Empirical observations, however, would indicate that this figure is somewhat high.

On this theoretical basis, the apparent consumption of bricks within the region would thus be 87.36 percent of total regional shipments. For a banner year such as 1962, when total shipments reached a record high of 754,497,000 bricks, regional consumption would have been on the order of 660,000,000. Based on an average of several years, however, the figure would be substantially lower.

Since similar data are available from the Waybill Statistics for structural tile, an apparent consumption figure for this commodity can be developed by the same process. The statistics indicate that an average of only 51 percent of structural tile shipped by rail from plants in the region is bound for points within the region, as compared with the 71 percent for brick. Also, an average amount equal to 89 percent of all out-shipments by rail is brought into the region by rail, as compared with the 20 percent for bricks.

Although the sampling procedures used to compile the Waybill Statistics have limitations which render the results less suitable for quantitative analysis than for developing percentage relationships, there is good reason to infer from these statistics that the proportion of all structural tile carried by rail is larger than that of brick. Bearing in mind that the waybill sample is one percent, consider the following comparative analysis.

	Brick	Tile
(1) Average annual tons by rail reported (1953-61)	3,027	2,345
(2) Sample X 100	302,700	234,500
(3) Average annual total shipments reported (1953-61)	1,219,674	139,218
(4) Rail shipments (line (2)) as percent of total shipments (line 3))	24.8	168.5

While the 24.8 percent of total shipments by rail appears reasonably accurate for brick, the figure for structural clay tile is patently unusable. Since the irregularity is fairly consistent through the years, however, it must be explained by the differences in the commodity definitions used by the two separate reporting agencies. Nevertheless, it is improbable that the category used for the Waybill Statistics could include sufficient other clay tile commodities to account for the total discrepancy. This would require a commodity category with over six times the volume of structural clay tile as reported by the Bureau of the Census. The more logical explanation is that the percentage of these products shipped by rail is higher than the 24.8 percent for brick.

Depending on the values assigned for the several variables - which are not as well established for structural tile as for brick - an indicated consumption of 75-100 thousand tons of structural tile per year is obtained for the three-state region. As this would represent about 15-20 percent of national consumption, however, it is probably somewhat on the high side, hence the lowering of the estimate to 50-60 thousand tons.

Waybill Statistics for brick and structural clay tile, on which the above conputations are based, are contained in the following tables.

TABLE 5
SELECTED WAYBILL STATISTICS FOR BRICK
THREE-STATE REGION
(one percent sample)

	Total Regional Shipments Reported (Tons)	Shipments To: Points Within Region	Points Outside Region	Shipments to Region From Outside
1953	3,640	2,725	915	86
1954	3,614	2,468	1,146	50
1955	3,779	2,874	905	268
1956	3,791	2,724	1,067	248
1957	2,903	1,957	946	101
1958	3,293	2,551	742	133
1959	2,609	1,550	1,059	44
1960	2,457	1,759	698	257
1961	1,159	763	396	379

TABLE 6
SELECTED WAYBILL STATISTICS FOR STRUCTURAL CLAY TILE
THREE-STATE REGION
(one percent sample)

	Total Regional Shipments Reported (Tons)	Shipments To: Points Within Region	Points Outside Region	Shipments to Region From Outside
1953	2,140	936	1,204	1,078
1954	2,597	1,557	1,040	719
1955	2,430	1,198	1,232	819
1956	2,580	1,468	1,112	1,135
1957	1,531	666	865	975
1958	1,857	957	900	1,227
1959	3,045	1,462	1,583	1,090
1960	2,491	1,335	1,156	975
1961	2,438	1,267	1,171	1,114

There is little information available concerning the consumption of drain tile, floor tile and lightweight aggregate in the three-state region. While some effort has been made to establish usable estimates for these commodities, nothing suitably reliable has been developed. On the surface, however, it would appear that consumption rates would be at or near the national average for drain tile and floor tile, but probably somewhat lower for lightweight clay aggregate.

Summary of Regional Supply and Demand

From the above analysis, it is indicated that the three-state region of Alabama, Georgia and Florida has a well-balanced and largely self-contained supply and demand situation with regard to structural clay products. This is so despite the fact that Florida is virtually a non-producer - the Florida market being served by the surplus production of Alabama and Georgia.

The region is of such size and shape that almost all of it lies within a 250 mile radial distance of the center, with only the southern half of the Florida peninsula being beyond the reach of economic transportation. Further, the actual distribution of production facilities in the region places practically all of the points except peninsular Florida within only a hundred miles of a source of supply.

Because of the ready availability of structural clay products, their usage in the region is common - again, with the exception of the Florida peninsula. The market within the region is growing, and regional consumption of structural clay products appears to have been slowly, yet steadily, increasing as a percentage of total United States consumption. Despite this growth in the internal market, however, regional production capacity appears to be more than adequate to meet the demand. Currently, a relatively small, but still significant, amount of regional production is marketed outside the region - mostly in neighboring states, but some as far away as Nebraska, Wisconsin, Michigan and New York.

Common brick, structural tile and drain tile are the principal structural clay commodities produced in the region, and also make up the greatest demand. Much of the ceramic tile and accessories, floor and wall tile, and other specialty products are brought in from outside the region. The use of lightweight clay aggregate in the region is still relatively unknown.

This, then, is the supply and demand picture in the general area surrounding Redevelopment Area A, in northwest Florida. On the surface it would seem that with the wide distribution of structural clay products plants in the region, and with the indicated present excess of production capacity over consumption, it would be difficult for the area to support another plant. On the other hand, there are factors which may make it possible for a new plant in a northwest Florida location to:

(a) capture a sufficient market from the area already being served by existing plants

(b) produce commodities for which there is only limited local competition
(c) penetrate the relatively unexploited market in the Florida peninsula.

The realization of any one of these possibilities on a sufficiently large scale could make the difference between a successful and an unsuccessful operation. These possibilities and other factors having a bearing on ultimate feasibility will be evaluated in the following section of this report.

MARKET POTENTIAL AND MARKETING PROSPECTS FOR A STRUCTURAL CLAY PRODUCTS PLANT IN NORTHWEST FLORIDA

The Case for a Florida Plant

Although the regional analysis above showed the structural clay products industry to be widely distributed throughout much of Alabama and Georgia, it revealed an almost complete lack of production facilities in Florida. The principal explanation given for this condition, of course, is the general unavailability of suitable raw materials in Florida. But across the northern part of the state there are clay deposits which are capable of being commercially developed for a clay products industry, as a brief review of earlier undertakings in this field will affirm.

Brick production in Florida dates far back in the state's history. Remains of old Spanish and English settlements indicate that brick was a common construction material in use at the time. By 1827, the brick and firebrick industry had grown to the point where these products were exported to other points along the Gulf of Mexico. The locations of over fifty brick plants in production before and shortly after the War Between the States have been recorded.

What may be called the modern era of brick manufacturing in Florida reached its peak in the early 1900's, and continued until 1930. A sharp decline in production was experienced at the beginning of the national economic depression, and the Florida industry did not recover until 1939 - the last year for which production data are available.

The last thirty-five years have been marked by a striking reduction in the number of brick plants in the state. From seventeen in the 1920's, the number has dropped to two in 1963 - one of which is a state-owned, non-commercial plant. Of the many reasons for this decline of the industry in Florida, probably the most critical were: (1) inferior or unsuitable raw materials locally, (2) the use of field kilns or poorly designed down-draft kilns which did not produce bricks of consistently high quality, (3) lack of sufficient raw material reserves locally, (4) insufficient market demands for the product within economical transportation distances, and (5) obsolete manufacturing equipment generally.

With the decline of the Florida industry, markets in the state were taken over by more distant, out-of-state producers. No serious effort to re-establish the industry in Florida has been considered justified to date, but the discovery some years ago of high-quality clay deposits along the banks of the Apalachicola River in northwest Florida has created considerable interest in this possibility. All available data now indicate that these deposits are suitable for commercial use in both quality and quantity.

With the availability of raw materials, a strong case on the surface can be made for the establishment of a structural clay products plant in this area. Several important factors support this contention: (1) being in the state of Florida would by itself give a plant a favored position from a public relations standpoint for competition inside the state, and in some cases might provide an advantage in lower intra-state freight rates, (2) there are no major plants within 150 miles of the area, suggesting the possibility of a significant local market readily accessible from this point, and (3) the position decidedly south of any of the existing plants in Alabama and Georgia would provide a significant distance advantage in competing for markets in the Florida peninsula. The combination of these factors would seem to warrant detailed investigation into market potential and marketing prospects.

Selection and Evaluation of a Plant Site

For various reasons, some of them discussed earlier, it is usually desirable to locate structural clay products plants in the vicinity of raw material supplies. The location of the most suitable clay deposits in the Redevelopment Area A would indicate placement of the proposed plant in the Bristol-Blountstown vicinity, on either side of the Apalachicola River. There is no town of significant size in the immediate area.

This site for a proposed structural clay products plant would have several advantages and several disadvantages. On the favorable side, the Apalachicola River - a federally maintained navigation project - offers possibilities for waterborne transportation, opening up new marketing horizons. Also an advantage is the proximity of the site to the main pipe line of the Houston, Texas, Gas and Oil Corporation, supplying natural gas to the area. Not favorable, however, is the limited transportation network - both highway and rail - in the area, and also the fact that the area is rather sparsely populated and slowly growing, affording a local market only of relatively low consumption.

Because all of Redevelopment Area A is basically similar in every aspect, there is little basis for discrimination in the selection of industrial sites in the area. This being the case, the location of the raw materials becomes the overriding factor, and the Bristol-Blountstown vicinity emerges as the logical site for the proposed structural clay products plant.

Identifying a Market Area

As in the case with most commodities, there are countless factors - some difficult of explanation - influencing the marketing patterns of structural clay products. Because of the uncertainties and inconsistencies in marketing behavior, it is impossible to define the exact geographical area within which a given source of supply will find it possible to compete. Generally speaking, however, the price of the commodity at the point of demand will govern marketing ability. Since, for the purpose of this study, all elements of production and marketing cost are assumed to be equal to those of existing competition, the only variable contributing to delivered commodity price is the transportation distance from the source of supply to the point of demand. For this reason, transportation distances are used as the single criterion for identifying the area in which a Bristol-Blountstown plant could expect to be competitive in the structural clay products market. On this basis, the market area for such a plant would be defined by a theoretical line connecting points at which the transportation distance from the proposed plant was equal to the transportation distance from the nearest existing plant.

Since there are no existing structural clay products plants to the south of the Bristol-Blountstown site, the extent of the probable market area into the Florida peninsula must be determined by practical transportation limits. Experience in this general area shows, for instance, that an active market for common brick cannot be generated in competition with concrete block if brick is priced higher than $40.00 - $45.00 per thousand. (In practically any typical locality, the initial installed cost for an eight-inch brick wall will run twice that for an eight-inch block wall - and block is already well-established as a popular building material in lower Florida.) Although production costs are not available for competing plants, a survey of the market indicates that the average f.o.b. plant cost for existing producers in the three-state region is currently about $28.00 - $30.00 per thousand. Allowing ten percent of the delivered cost as profit for the local distributor, this would mean that no more than about $10.00 per thousand could be allowed for transportation and handling costs between the plant and the eventual outlet. This amount would provide for transportation up to a maximum of about 250 miles, which distance was used as the limit of the principal market area on the east and southeast.

In addition to the primary market area for a Bristol-Blountstown plant defined on the basis described above, consideration was given to the secondary market area to be served by a combination of waterborne and land transportation. Since the proposed plant would be constructed on or very near a navigable waterway, it would be possible to barge the finished product to the Gulf of Mexico and thence in almost any direction where a market might be found.

This favorable circumstance offers untold possibilities, but the most promising at this time is again peninsula Florida - where supply problems have restricted the use of clay products, and which is easily accessible to waterborne traffic.

Since Tampa is the major port serving the Florida Gulf coast, and is the center of a rapidly growing metropolitan area, this would offer the most logical choice as a destination and distribution center for products barged from a Bristol-Blountstown plant. Once the product was unloaded at the Tampa dock, practical transportation factors would govern the area in which they could be effectively marketed. Because of the virtual monopoly concrete products now enjoy in the masonry construction industry of the area, it is probable that here clay products would have to cut the cost advantage of concrete products even more than in areas farther north where clay masonry is accepted and popular. It appears now that about a fifty-mile radius from the Tampa unloading point would be the limit of this secondary market area.

These two market areas, the area generally surrounding the proposed plant site and the separated area in the immediate vicinity of Tampa, will be referred to as the primary and secondary market areas, respectively, and are described in greater detail below.

Extent and Characteristics of the Market Areas

The primary market area - In locating the northern extent of the primary market area, several minor producing facilities - because of the limited or sporadic nature of their operations - were generally ignored. Included in these were small brick plants at Newton, Alabama, and Thomasville, Georgia, and a drain tile plant at Geneva, Alabama. Probable major competition for the brick market was assumed to come from plants at Barth, Florida, Montgomery, Alabama, and Columbus, Macon and Augusta, Georgia. Plants at Fairhope, Montgomery and Phenix City, Alabama, and Macon, Milledgeville, and Augusta, Georgia, are expected to provide major competition for structural clay tile. Major drain tile plants were considered to be those at Fairhope, Montgomery, and Phenix City, Alabama, and Milledgeville, Georgia. There is no significant floor and wall tile industry in the area. Lightweight clay aggregate plants in the area are so few as to be inconsequential in affecting the market area of another plant.

Because the points of probable major competition in the three most important products are essentially the same, the configuration of the resultant primary market area boundaries is nearly identical. The line would pass between DeFuniak Springs and Crestview, Florida, on the west, curve eastward through Enterprise, Alabama, and continue to the east and southeast through southern Georgia to the Atlantic seaboard north of Jacksonville, Florida (Figures 3 and 4). On the south, the line along the 250 mile radial distance, would extend from the Gulf of Mexico to the Atlantic Ocean, passing near Brooksville, Leesburg, and Bunnell, Florida.

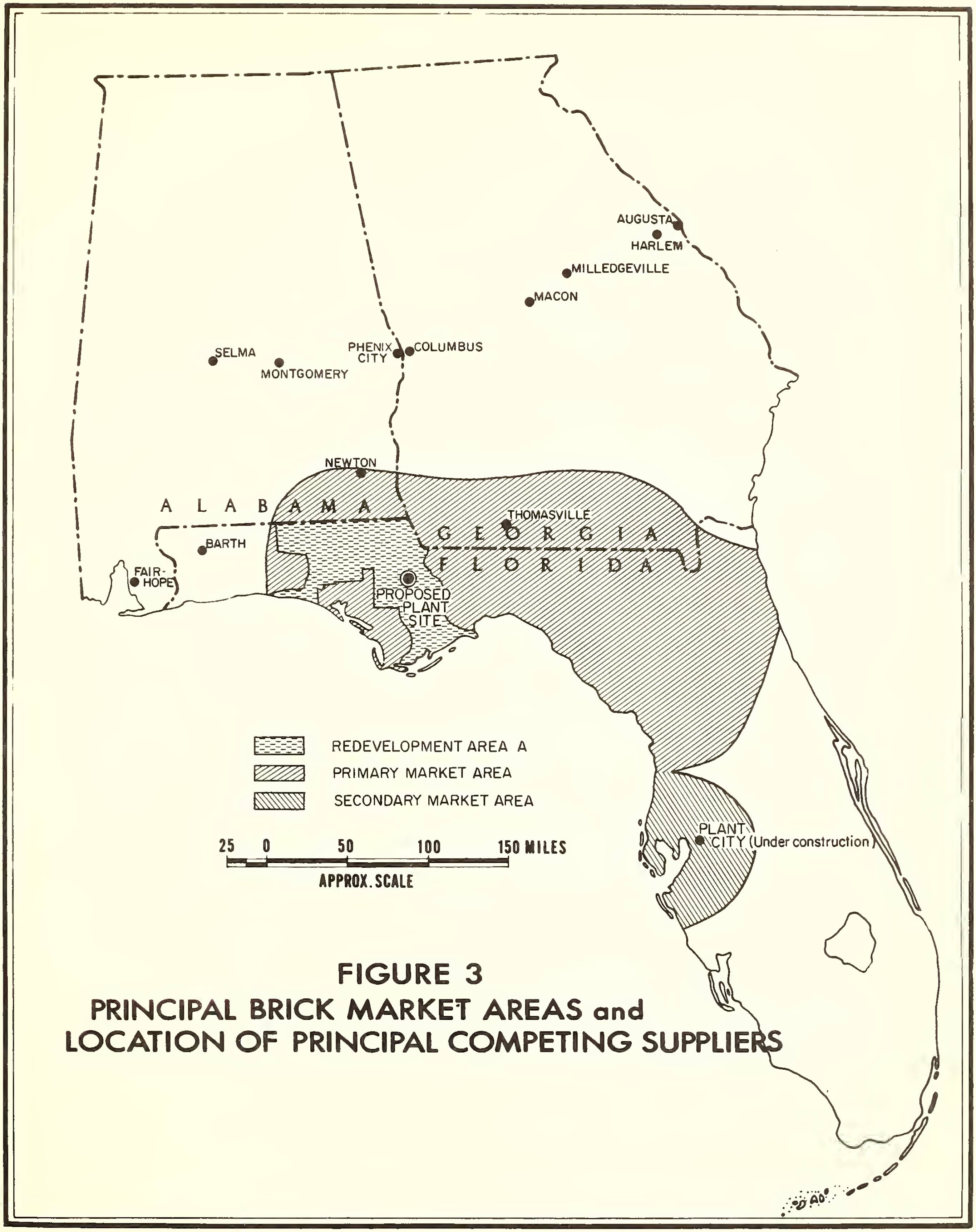


FIGURE 3
PRINCIPAL BRICK MARKET AREAS and LOCATION OF PRINCIPAL COMPETING SUPPLIERS

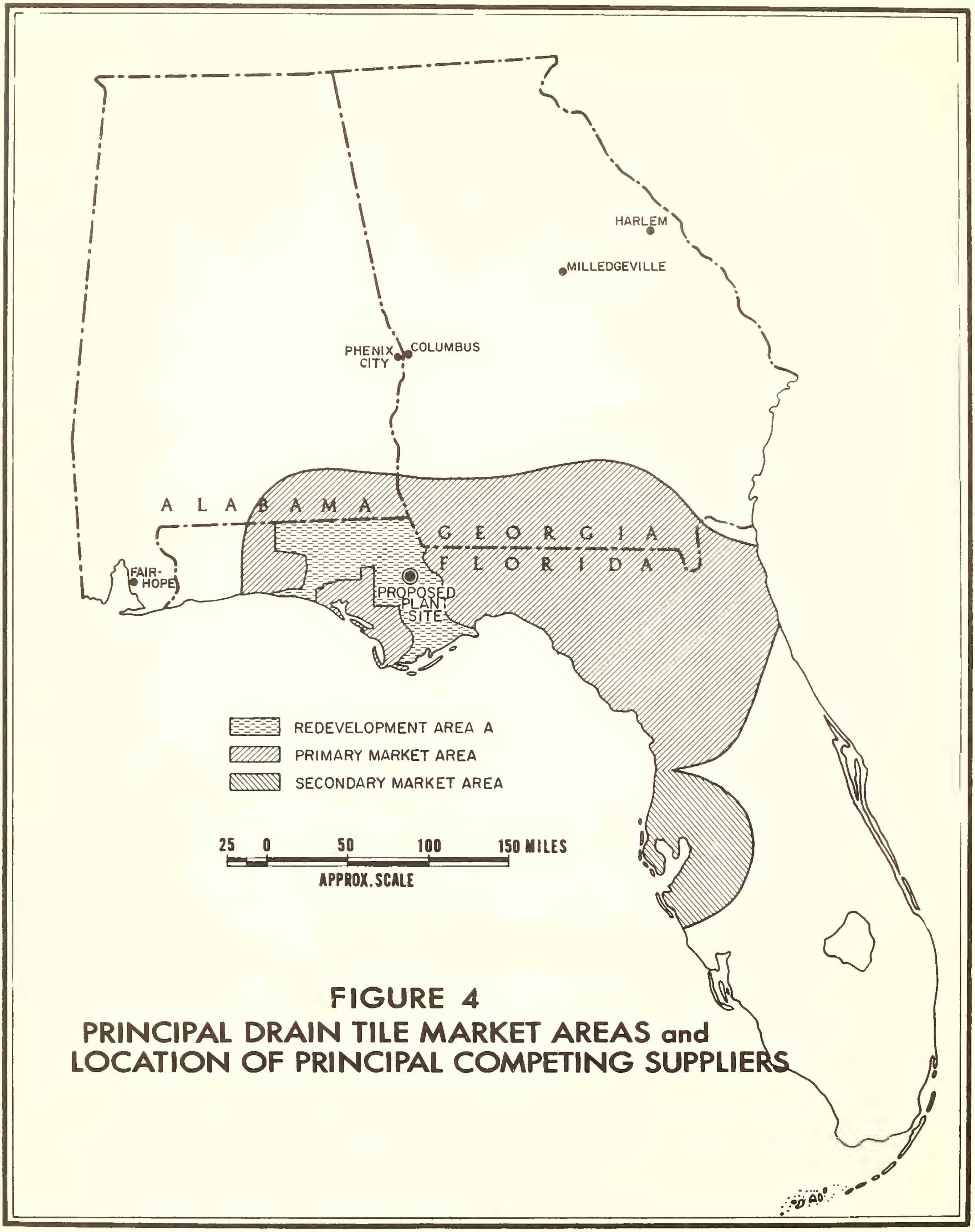


FIGURE 4
PRINCIPAL DRAIN TILE MARKET AREAS and LOCATION OF PRINCIPAL COMPETING SUPPLIERS

The primary market area thus defined is about 32,000 square miles in areal extent, and has a current population of about 1,550,000. The area is largely rural, with Jacksonville being the only major metropolitan center. Other cities of significant size are Dothan, Alabama, Bainbridge, Moultrie, Thomasville, and Valdosta, Georgia, and Panama City, Tallahassee, St. Augustine, Gainesville, and Ocala, Florida. With the exception of the industrial and business center at Jacksonville, the economy of the area is primarily dependent on agriculture and forestry, with government industry and tourism important in isolated localities. A fairly good system of highways and railroads crisscrosses the area, connecting numerous small towns (Figure 5). The area as a whole has not grown significantly in recent years, with the rate of population growth between 1950 and 1960 being only 22.3 percent, as compared with 31.1 percent for the three-state region, and 19.0 percent for the United States.

The secondary market area - The secondary market area extends roughly from Brooksville on the north-where it is approximately contiguous with the primary market area - curving southward to Winter Haven on the east, and thence to Sarasota on the south (Figures 3 and 4). Somewhat in contrast with the primary market area described above, the secondary market area is much smaller in size and is characterized by a far more dynamic economy and much faster rate of population growth.

Only 4,500 square miles in size, the secondary market area contains one of the major population centers of Florida. Current population is about 1,190,000, only slightly less than the much larger primary market area. Even more important is the impressive growth rate, which reached 85.0 percent for the period between 1950 and 1960, and is expected to continue strong for some time to come. This healthy growth is supported by an expanding economic base in which industry, tourism, agriculture, mining, government and commerce all play an important part. Population in the area is highly concentrated. In addition to the Tampa-St. Petersburg metropolitan center, there are other cities of significant size including Clearwater, Lakeland, Winter Haven, Bartow, Plant City, Bradenton and Sarasota.

Outside the market areas - Obviously, all of the output of a Bristol-Blountstown clay products plant would not necessarily be marketed in the areas defined and described above. Under certain circumstances, products could be marketed hundreds of miles away in almost any direction. Especially to the north, there would undoubtedly be considerable exchange of markets with the various plants already existing in that area. The primary and secondary areas as defined, however, are the principal areas in which a Bristol-Blountstown plant could market its products from a practical standpoint, and could expect to enjoy a strong competitive position.

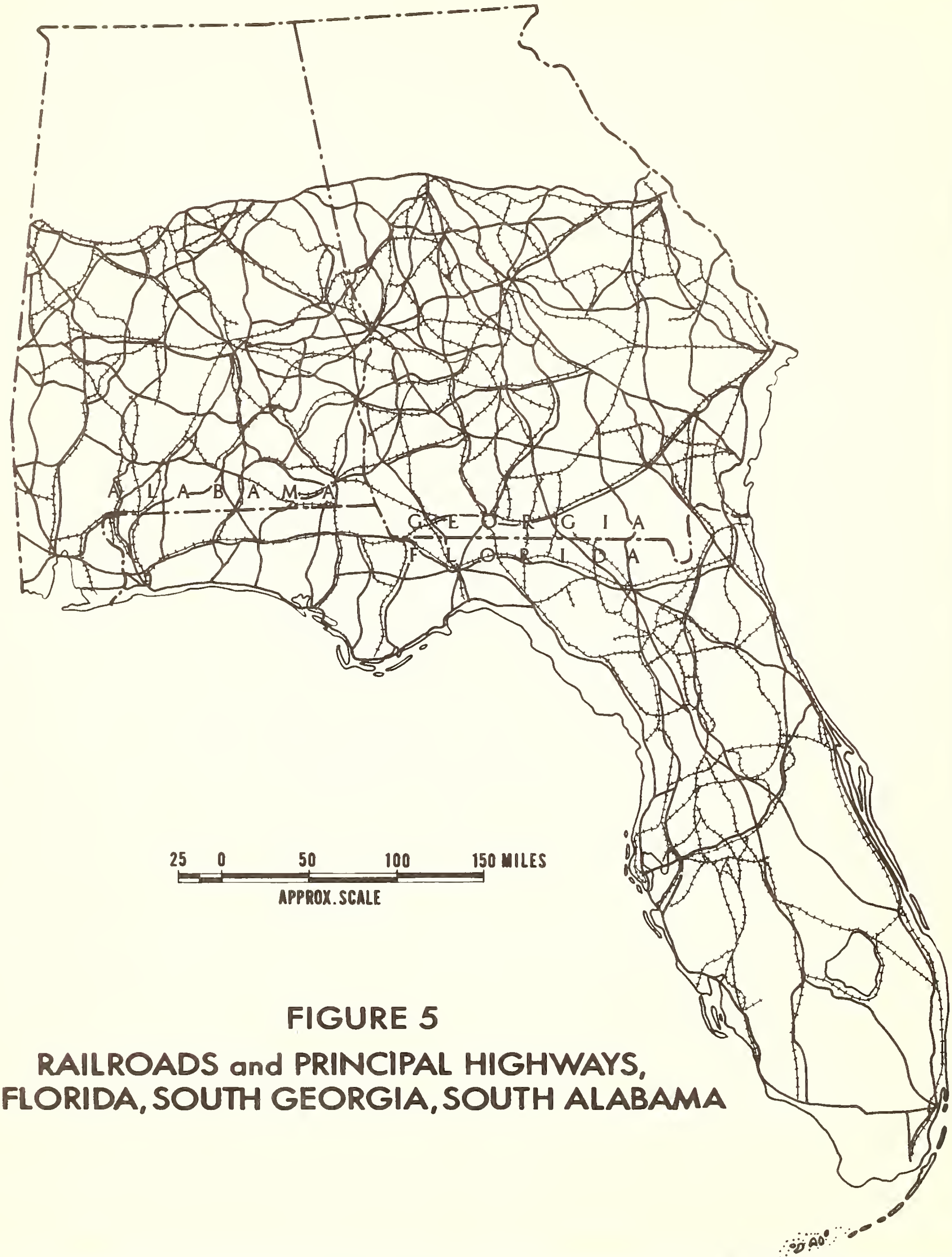


FIGURE 5

RAILROADS and PRINCIPAL HIGHWAYS, FLORIDA, SOUTH GEORGIA, SOUTH ALABAMA

Comsumption and Demand in the Market Areas

Total consumption and rates of consumption of structural clay products in the market areas indicate the demand which will determine the justification for an additional plant. It matters little how competitive such a plant might be in the area if the volume of demand is not sufficient to support a production operation of economical size. Because of the basic importance of this factor, a very careful effort was made to ascertain the amount of structural clay products currently used in the market areas and to identify trends in the use of these products established in the recent past. As background for this important phase of the study, the approach used for gathering this information is discussed briefly below.

Survey Methodology - Since there are no compiled figures for consumption or use of structural clay products at the local level, it was necessary that some type of survey or canvass be made of the major suppliers and users of these products within the identified market areas. For this purpose, it was assumed that the principal distribution points for the products would be the cities and towns with a population in excess of 5,000. Spot checking of many of the towns of smaller size revealed that they contained, in fact, very few marketers or major users of structural clay products. Classified business directories in local telephone books were consulted for listings of possible distributors or major users of structural clay products. Most of these were found under the headings of "building materials" for suppliers, and "general contractors" for users. In all, this process disclosed 175 possible major suppliers and 371 possible major users in twenty-three cities and towns in the primary market area. The secondary market area produced 168 possible suppliers and 238 possible users in twelve cities and towns.

Since the scope of the study would not permit a hundred percent canvass of sales and purchases in the market areas, thirteen of the towns in the primary market area were selected on the basis of their geographic distribution and size to represent the area. In the secondary market area, only two - Tampa and St. Petersburg - serving well over three-fourths of the area population, were selected. Two approaches were used for the survey, to serve as a check on each other. In the first, a twenty percent random sample - but no less than three in the case of the smaller towns - of all suppliers and contractors was used. In the second, all of the highest volume dealers and users, identified by others in the business, were canvassed. Between the two methods, a hundred percent sample was actually taken for some of the smaller towns. Care was exercised to prevent duplication in reported figures for sales and purchases.

The survey was conducted by direct interview with cognizant representatives of the selected builders supply houses and general contracting firms. Questions were asked concerning purchases, sales and use of five specific types of structural clay products:

(a) common and face brick
(b) structural clay tile

(c) quarry tile
(d) drain tile
(e) lightweight clay aggregate

Incidental information on sources of supply, transportation, prices, marketing trends, customer preferences, and other factors bearing on the marketing prospects for structural clay products were also solicited.

Consumption and Demand - Brick - Brick is by far the most popular structural clay product used in the market areas, and the one that offers the best possibility for justifying a plant in the area. Brick is still the most prestigious wall material for residential construction, and the great variety in which it is offered makes it useful for many architectural applications. One of the types of brick in greatest demand in both market areas is the used, or reclaimed, brick. A survey made in a typical city in the primary market area revealed that used brick was used at least to a major degree in almost half of the brick masonry dwellings constructed in 1962. While this fact has a profound impact on the potential market for new brick, the actual consumption rate for this commodity is difficult to ascertain. It is believed, however, that the continuing use of used brick will be held in balance by the supply available at any given time, and that the estimated market for new brick will not be further invaded.

In addition to the survey reports, helpful information in estimating brick consumption in the primary market area is available from at least three other sources: an estimate for Florida by major market area, made in 1949; an estimate for north Florida area between Panama City and Lake City, made in 1959; and an estimate made for an area inclusive of but somewhat larger than the primary market area, made about 1960. Analysis of all available data indicates that most of north Florida, southeast Alabama and south Georgia use brick at a rate very close to the national average, while the Jacksonville market area is considerably higher than the national average and most of peninsular Florida much lower.

Figures adjusted from actual reported consumption are given below.

	Reported Brick Consumption	Population	Per Capita Rate
Primary market area	102,000,000	1,550,000	66
Jacksonville market	75,000,000	750,000	100
Remainder	27,000,000	800,000	34

Compared with the national per capita average brick consumption of 35-40, and the three-state regional consumption of about 40 per person, the figure for the rural part of the market area appears valid. The figure for the Jacksonville area seems high in the light of empirical observation, but there are several factors which might enter

into the explanation. First, because it is a rapidly growing metropolitan area, it stands to reason that it would be an actively promoted market. Competition would tend to drive the prices down and stimulate greater use. The fact that one major producer barges brick from Augusta, Georgia, to Jacksonville would undoubtedly be a contributing factor in local marketing economics. Finally, there is a possibility that all of the volume reported for the area is not actually consumed in the area, and that a considerable portion is transshipped to other points outside the immediate Jacksonville market area.

For comparison, the consumption rates indicated for various parts of the primary market area by the three estimates referred to earlier are given below.

	Brick Consumption	Population	Per Capita
1949 estimate	95,000,000	2,750,000	35
1959 estimate	10,000,000	362,000	28
1960 estimate	100,000,000	2,500,000	40

On the basis of this overall analysis, it seems reasonable to assume that a strong, active brick market in the Jacksonville area, combined with average consumption in the rest of the area, would produce a total average consumption for the primary market area of at least 75,000,000 units per year.

In the secondary market area, the present demand for brick is substantially lower, resulting in correspondingly lower consumption. The adjusted total consumption reported for the Tampa-St. Petersburg area was 15,000,000 units, which would reduce to a per capita average of about 15. The only other estimate available for comparison is the one made in 1949, which assigned 25,000,000 units as the Tampa market area's share of estimated state consumption. With a population of approximately 700,000 for that year, this would indicate a per capita rate of 36 units, or the same use rate as estimated by that study for the state as a whole.

It is readily apparent from statements of informed persons in the area that this part of Florida is not a heavy consumer of brick or other structural clay products, and that an estimate comparable to the state average would be too high. On the other hand, the same sources of information would indicate that the 15,000,000 units reported by the survey is a low figure. It would appear, then, that present consumption of brick in the secondary market area could be put conservatively at 25,000,000 units per year.

Consumption and Demand - Structural tile - Consumption of structural clay tile is rather minor in both market areas, and appears to be continuing to decline in usage. Formerly used more extensively in the construction of non-residential buildings, it has been largely

displaced by concrete block. Out of more than one hundred interviews with major suppliers and users of structural clay products, only six in the primary market area and none in the secondary market area reported sales or use of structural clay tile. Of these, only one - a supplier in Jacksonville - reported a significant volume. From all indications, it is doubtful that total consumption would exceed 5,000 tons per year. At least half of this would be in the Jacksonville area, and almost none at all in the secondary market area. It must be concluded that there is very little demand for this commodity in the two market areas.

Consumption and Demand - Quarry tile - Because most quarry tile is purchased and installed by tile contractors, very little use of this product was evidenced by the interview survey of major building materials suppliers and general contractors. Persons in the trade, however, indicate that this commodity enjoys a fairly stable position in the area, although still of only minor importance compared with other finish floor materials. Quality improvements, wider variety and reduced costs in finished concrete, terazzo and vinyl tile products have prevented any major increase in the use of quarry tile. No quantitative estimate of consumption is possible from the limited data produced, but it is known that combined usage in the two market areas is inadequate to have a significant effect in the final determination of plant feasibility.

Consumption and Demand - Drain tile - Clay drain tile is a commodity generally distributed through a variety of outlets. This fact, combined with the inability of many builders' supply dealers to estimate their sales of this product, has made it impossible to obtain reliable consumption figures from the direct interview survey. For this reason, an alternative method of estimation was employed.

Drain tile in this area is used almost exclusively for construction of septic tant drain fields. Florida State Board of Health figures, compiled by counties, show that there were 2,915 septic tank systems installed in the Florida portion of the primary market area in 1962. Excluding the Jacksonville metropolitan area as being non-typical, the rest of the north Florida area was used as a basis for developing average figures for the Georgia and Alabama portions of the primary market area, which are similar in most respects to neighboring parts of Florida. By this method, it is estimated that there were roughly 4,500 septic tank systems installed in the primary market area in 1962. At an average of 125 feet of drain field per system, this would represent usage of some 562,000 linear feet of drain tile. Similar procedure applied to 6,500 septic tank systems in the secondary market area would result in another 812,000 linear feet.

Rapid development and expansion of municipal and other sewerage systems has resulted in a steady decline in the number of septic tank systems installed in the area in recent years, despite an overall increase in population. This has reduced the demand for

drain tile proportionately. It is expected, however, that the trend will stabilize and possible reverse when municipal systems have reached their practical limit of coverage. Septic tank use in rural areas should then create a fairly steady, but smaller than present, demand for drain tile.

Consumption and Demand - Lightweight clay aggregate - Expanded clay aggregate is still a relatively unknown commodity in the market areas. Of the more than a hundred suppliers and users of structural clay products interviewed, only three reported handling this product, and these only in insignificant amounts. This limited use can be attributed in part to a general unfamiliarity with the product. While this could be overcome to a large extent by effective promotion, a more serious limitation to expanding the market potential for lightweight clay aggregate is its high cost in relation to other lightweight aggregates. Plant prices for lightweight clay aggregate, for instance, will run about twice as much as comparable prices for expanded slag, readily available from the Birmingham areas of Alabama, where it is produced as a by-product of the steel industry. This price differential effectively restricts use of the more expensive clay product to certain highly specialized purposes. Another factor which has limited the use of lightweight aggregate in general in the two market areas is the relative absence of high-rise buildings in the construction requirements of the area.

Despite the rapid increase in the use of lightweight clay aggregate in the national picture, there is no indication that a market of significant proportions could be developed in this area at the present time. Only the metropolitan centers of Jacksonville and Tampa would appear to offer promise of a potentially good market, and competition from less expensive alternative products would present a serious, possibly insuperable, obstacle to effective promotion. It thus appears that there is inadequate demand for a lightweight clay aggregate in prospect to warrant any detailed attention to manufacturing possibilities at this time.

Conclusion as to Marketable Commodities

From the summary of consumption and demand presented above, it appears that only two of the five structural clay products considered offer sufficient market potential to conceivably justify establishment of a manufacturing plant in Redevelopment Area A. Brick, because of its significant volume of demand and its continuing popularity as a building material, is one possibility, and drain tile, because of a fairly universal and steady demand, is another. The demand, either present or potential, for structural clay tile, quarry tile and lightweight clay aggregate in considered insufficient to contribute measurably to justification of a manufacturing plant, and these commodities will be given only incidental attention in the remainder of the report.

As brick and drain tile have been identified as the two structural clay products which offer the greatest promise of supporting a manufacturing operation in the area, separate market area maps

(figures 3 and 4) have been provided for each commodity to permit easy reference during the following analysis. Although the market areas are essentially the same, they differ somewhat along the northern perimeter according to the location of existing competition. Within the respective market areas for these two commodities is an estimated present demand for 100,000 bricks and 1,500,000 linear feet of drain tile. The key to marketing feasibility for a manufacturing plant in the Bristol-Blountstown area lies in the ability of such a plant to capture a sufficient portion of this potential market to support an operation of economical size.

Prospects for Capturing the Market

Factors influencing marketing ability - If a structural clay products industry is to be established successfully in Redevelopment Area A, it will have to capture a significant portion of the area market already being supplied by existing plants. Trends in the industry are toward larger capacity plants, and experience would indicate that a new operation should have a capacity in excess of 100,000 brick equivalents per day in order to produce on an economical basis and on an equal footing with existing competion. This would mean that of the present demand in the primary and secondary market areas of 100,000,000 bricks per year, a Bristol-Blountstown plant would need to capture something on the order of 30,000,000 to 35,000,000 or 30 percent to 35 percent. The actual figure can be flexible to a considerable degree, of course, but the illustration given here points up the magnitude of the incursion which a new plant must make in the established market of existing plants. For an indication of how successful the new plant might expect to be in this competitive endeavor, several factors must be considered.

A survey of major purchasers of structural clay products reveals that among the most important factors influencing their selection of suppliers are: quality of product, price, service, and availability of special types of products, such as a particular color, finish or size. Interestingly enough, price does not appear to be the predominant consideration. Rather, quality of the product and service provided by the supplier are generally regarded as more important. Such opinion is colored by experience in an area supplied from many sources, however, with consequently little variation in price. It undoubtedly would not hold true to the same extent if the price differential between two reasonably acceptable products were substantial.

While quality and type suitability of the product are determined in the manufacturing and usually speak for themselves, service is an aspect of making the finished product available to the buyer and, as such, is far more complex and unpredictable in its effect on the decision to buy. When other factors are equal - as they frequently are - service can swing the balance to one side or the other. Thus, while having nothing at all to do with the product per se, it is probably the single greatest variable in the marketing

process. Among the specific service desires expressed by buyers, the following are among the most important: (1) delivery of the product when and where needed, (2) shipment of odd lots without undue delay and price penalty, (3) allowances and quick adjustment for chipped and broken products, (4) promotion and advertising help, and (5) assistance with special design and other technical problems in the use and application of the products. Obviously, to maintain a competitive position, a supplier has to be willing to do as much as possible for the customer.

Of all the factors influencing the decision to buy, however, the one most tangible and subject to comparison between competing products is price. The delivered price of the commodity is made up essentially of four elements: manufacturing cost, marketing cost, delivery cost and profit. All of these elements are more or less fixed as to any given product and point of delivery. Delivery costs, of course, will vary greatly for different destinations and methods of transportation, and the profit element may be varied considerably - depending on the other three elements - in order to stay competitive. In some cases it may be desirable to cut profit virtually to nothing in favor of maintaining market outlets and volume of sales.

There are many other factors which have a bearing on customer preferences. Business tie-ins, personal friendships, state or sectional loyalties and the element of chance all play a part in influencing the customer's decision. These and the countless other similar factors are highly uncertain and intangible, however, and their full impact cannot be ascertained or evaluated.

As mentioned at the outset, for the purpose of this study all elements of cost must be assumed to be essentially the same for a Bristol-Blountstown plant as for existing plants in the area. In addition, it must also be assumed that other marketing factors such as quality of product, customer services, etc., are at parity with existing competition. Tentative analysis would indicate this to be so, but only on further investigation of these specific points, and, to a great extent, actual operating experience can a final determination be based.

With these assumptions of equality of conditions between a Bristol-Blountstown plant and existing plants now serving the market area, only the variable of transportation cost from the plant to the market stands out as a significant factor in marketing ability. Because transportation costs are relatively high for structural clay products, however, and make up a large part of the delivered price in most cases, this factor alone will have tremendous effect in re-shaping marketing patterns in the entire area. Transportation costs - which are a function of distance and method of transportation - are thus used as the primary basis for estimating prospects of marketing success for a structural clay products plant located in the Bristol-Blountstown area.

<u>Existing competition and marketing patterns.</u> The geographic

distribution of structural clay products plants in the Alabama-Georgia-Florida area are discussed in the regional analysis and is shown on figure 2. Almost every one of these plants markets a portion of its output in the market area identified for the Bristol-Blountstown site. Some command a larger share of this market than others, for a variety of reasons. Some have been successful in supplying particular markets ostensibly more favorabley located to other sources of supply. The marketing patterns resulting from this actual experience point up the nature and source of major competition which can be expected by a Bristol-Blountstown site.

Of the estimated 100,000,000 units per year present demand for bricks in the primary and secondary market areas, 50 percent is attributed to the Jacksonville distribution area. Because of its large volume and steady increase in demand, Jacksonville is a prime market outlet. At the present time, plants in Augusta, Georgia, supply about half of this market. A significant factor contributing to this situation is the large distribution center maintained in Jacksonville by one of the Augusta plants. This local distribution center is served by barge transportation, and lower shipping costs have given this company a decided advantage in delivered commodity prices. It is of importance to note that Augusta, located on the Savannah River, has the only plants of consequential size in the area with ready access to the Atlantic waterways system.

In addition to Augusta, Macon and Columbus, Georgia, also supply a substantial part of the Jacksonville market, relying primarily on rail transportation. These three sources together probably account for 75 percent to 80 percent of the Jacksonville demand, with the remainder being supplied by numerous other plants in relatively insignificant amounts.

While Jacksonville may be something of a special case, it is still surprisingly typical of the rest of the primary market area in its supply pattern. The essential difference between the two patterns is in the predominant sources of supply. For twelve principal distribution points, other than Jacksonville, in the primary market area, representing practically all of the remaining demand, Macon and Columbus account for about 72 percent of the supply. Nine other specific sources of supply were reported as sharing in this market. The distribution of the market for a typical year is illustrated in the following figures.

TABLE 7

SOURCE OF SUPPLY FOR REPORTED SONSUMPTION
BY SAMPLED DEALERS AND USERS OF BRICK IN THE
PRIMARY MARKET AREA (IN BRICK EQUIVALENTS)

Source	Brick Units	% of Total
Macon, Georgia	4,476,500	(41.4%)

TABLE 7 continued

Source	Brick Units	% of Total
Columbus, Georgia	3,312,250	(30.6%)
Augusta, Georgia	884,000	(8.2%)
Selma, Alabama	749,250	(8.9%)
Thomasville, Georgia	480,000	(4.4%)
Birmingham, Alabama	352,000	(3.3%)
Holly Springs, Mississippi	62,500	(0.6%)
Jackson, Mississippi	60,000	(0.6%)
Montgomery, Alabama	57,500	(0.5%)
Milledgeville, Georgia	50,000	(0.5%)
Newton, Alabama	12,000	(0.1%)
Unknown or Unidentified	310,000	(2.9%)
	10,807,000	(100.0%)

The scattered distribution points in the rural portion of the primary market area are presently supplied primarily by truck, although rail is still used extensively, especially in the more distant points such as Gainesville.

As with Jacksonville and the primary market area, the secondary area is supplied for the most part by plants in Columbus, Macon and Augusta, with the first two accounting for a great majority. Other sources of supply are represented primarily in the marketing of special type products. Purchases from as far away as Texas and Ohio were reported. The secondary market area, being some 350 miles from the closest major producing plant, is supplied almost exclusively by rail.

For drain tile, the other principal commodity under consideration, a somewhat different pattern emerges. Because quantitative data on this product are incomplete, it is not possible to make an exact percentage break-down of sources of supply. Reported information, however, reveals that Birmingham, Alabama, Columbus, Milledgeville and Harlem (immediately west of Augusta), Georgia, and Columbia, South Carolina, are all significant suppliers. Among these, Milledgeville stands out as being by far the major source of supply for both the primary and secondary market areas, accounting for something in excess of 50 percent of the total market. Except for the extreme westerly part of the primary market area, where Birmingham predominates, Milledgeville is universally the principal competitor in this industry.

Drain tile is shipped almost exclusively by truck, regardless of point of origin and the transportation distance involved. Only in the case of Tampa-St. Petersburg and Jacksonville, both major distribution centers, was any rail transportation of this product reported.

From this brief analysis, it is obvious that major competition in both market areas can be expected from plants in Columbus, Macon and Augusta in the case of brick, and from Milledgeville in the case

of drain tile. Other producers, even some considerably closer than these major sources, play a relatively minor role in meeting present demand, except in the case of certain specialty products. Columbus, Macon and Augusta each have two brick plants of appreciable size, and these firms are all well established in the area and able to compete with virtually any possible source of supply. The large drain tile plant in Milledgeville is similarly well situated with regard to its present markets. Any significant inroads in the entrenched market of these producers, especially by a plant of smaller capacity, will almost certainly have to be made on the basis of transportation cost advantages. This important aspect of the marketing process is explored in detail in the following section.

Transportation - a comparative analysis.

The primary market area - The proposed Bristol - Blountstown plant site is so located with respect to its primary market area that conventional, overland methods of transportation would be used. The possibilities, of cource, include rail and the several varying arrangements for truck transport. The rail and highway networks of the area are shown on figure 5. Rail connections serving the Bristol-Blountstown locality are less than desirable, but for the longer hauls in which rail transportation would be employed this may not present a major handicap. Also, it is not wholly inconceivable that a new track, linking Bristol with the Seaboard Air Line track west of Tallahassee, could be justified if rail transportation ever took on an aspect of greater importance. Other than this, however, there is no apparent déficiency in physical facilities that would place the proposed plant site at a serious initial disadvantage.

Most of the primary market area is supplied by truck from the existing competitors, and it is fully indicated that this means of transportation would have to be employed by a Bristol-Blountstown plant. As discussed earlier in reviewing the national transportation trends in the industry, trucks offer several distinct advantages over rail for relatively short hauls, and it was on the basis of an assumed 250 mile practical distance limitation for truck hauling that the southern boundry of the primary market area was defined. Primary among the advantages of truck transportation, of course, are (1) the availability of special equipment, to facilitate loading and unloading as well as to provide more efficient transportation, (2) the flexibility permitted by individual dispatching on wholly independent schedules, (3) the susceptibility to ownership and/or control by individual firms, (4) the ability to deliver to any selected destination, including job-sites, (5) a reduced economic loss factor for delivery in less-than carload lots, and (6) more direct routing with less loss of time in transit.

Rail transportation is still used extensively for shipping long distances and to large distribution centers where time in transit and point of delivery are of less consequence.

In addition to the trend from rail to truck transportation generally, there has been another significant development in the use of contract haulers or individually owned or leased trucking equipment. This arrangement not only amplifies the inherent advantages of truck transportation enumerated above, but also results in considerable reduction in cost over the use of common carriers.

With these transportation developments in the industry, virtually all of the producers with which a Bristol-Blountstown plant would compete now rely on individually owned, rented or leased trucking equipment to serve the primary market area. Assuming that a Bristol-Blountstown plant would employ the same type of arrangement, and that the equipment would be available on similar terms, then distance alone would be the factor which would determine relative differences in transportation costs. The amount of the difference would additionally be determined by the cost of operating the trucking rig.

Within the framework of the ablve assumption, the mileage tables given below will indicate where the relative transportation cost advantage lies in supplying principal distribution points in the primary market area. Although, in fact, any one of several major existing suppliers may prove to be the principal competitor for a particular market because of other factors not related to transportation, the closest existing plant is used as the assumed competitor for this analysis.

TABLE 8
RELATIVE TRANSPORTATION ADVANTAGE
AS INDICATED BY COMPARATIVE HIGHWAY DISTANCES
TO PRIMARY MARKET AREA DISTRIBUTION POINTS
FROM PROPOSED PLANT SITE AND CLOSEST EXISTING COMPETION

Brick

Distribution Point	Closest Existing Competition	Distance From Existing Competition	Distance From Bristol-Blountstown	Bristol-Blountstown Advantage
Dothan, Ala.	Columbus, Ga.	104	66	- 38
Bainbridge, Ga.	Columbus, Ga.	128	54	- 74
Moultrie, Ga.	Columbus, Ga.	125	110	- 15
Valdosta, Ga.	Macon, Ga.	149	121	- 28
Jacksonville, Fla.	Macon, Ga.	225	217	- 8
Gainesville, Fla.	Macon, Ga.	260	192	- 68
Ocala, Fla.	Macon, Ga.	298	217	- 81
Tallahassee, Fla.	Columbus, Ga.	164	47	-117
Panama City, Fla.	Barth, Fla.	133	51	- 82
De Funiak Springs, Fla.	Barth, Fla.	94	85	- 9

Drain Tile

Distribution Point	Closest Existing Competition	Distance From Existing Competition	Distance From Bristol-Blountstown	Bristol-Blountstown Advantage
Dothan, Ala.	Columbus, Ga	106	66	- 40
Bainbridge, Ga.	Columbus, Ga.	130	54	- 76
Moultrie, Ga.	Columbus, Ga.	133	110	- 23
Valdosta, Ga.	Columbus, Ga.	176	121	- 55
Jacksonville, Fla	Harlem, Ga.	233	217	- 16
Gainesville, Fla	Harlem, Ga.	309	192	-117
Ocala, Fla.	Harlem, Ga.	346	217	-129
Tallahassee, Fla	Columbus, Ga.	172	47	-125
Panama City, Fla.	Fairhope, Ala.	151	51	-100
De Funiak Springs, Fla.	Fairhope, Ala.	115	85	- 30

All of the selected distribution points in the table above are more favorable located, on the basis of highway distance, to the Bristol-Blountstown site. Since the perimeter of the primary market area is essentially traced by points included above, all other points in the area would thus be at least as equally favorably located. The relative advantage for the Bristol-Blountstown site in the brick market varies from 117 miles for the Tallahassee distribution point to only eight miles for the Jacksonville distribution point. Assuming an average transportation cost of 3¢ per ton/mile - considered a probably minimum for a medium distance haul - the magnitude of the cost advantage would be indicated by the following figures for each of the two principal commodities.

Bricks (per 1000)

Distribution Point	Distance Advantage	Cost Advantage	Distance Advantage	Cost Advantage
Dothan, Ala.	38 miles	$ 2.28	66 miles	$ 1.88
Bainbridge, Ga.	74 miles	4.44	54 miles	1.62
Moultrie, Ga.	15 miles	.90	110 miles	3.30
Valdosta, Ga.	28 miles	1.48	121 miles	3.63
Jacksonville, Fla.	8 miles	.48	217 miles	6.51
Gainesville, Fla.	68 miles	4.08	192 miles	4.76
Ocala, Fla.	81 miles	4.86	217 miles	6.51
Tallahassee, Fla.	117 miles	7.02	47 miles	1.41
Panama City, Fla.	82 miles	4.92	51 miles	1.03
De Funiak Springs, Fla.	9 miles	.54	85 miles	2.55

The figures above reveal that a Bristol-Blountstown plant would have a substantial transportation cost advantage over existing competition in serving most of the distribution points in the brick market of the primary market area, but a relatively negligible advantage in the important Jacksonville area. Still, with other factors being essentially equal, any savings in transportation costs would enhance the proposed plant's competitive position. The degree of transportation cost advantage must be taken into consideration in weighing the chances of a Bristol-Blountstown plant in capturing the market from existing suppliers.

Although it is highly unlikely that a significant portion of the market could be served on a competitive basis by use of common carrier truck transportation, the applicable inter-state and intrastate rates are tabulated below to provide a second comparison of the relative transportation cost advantage to be enjoyed by a Bristol-Blountstown plant.

TABLE 9

TRUCK TRANSPORTATION COST ADVANTAGE TO PRIMARY MARKET DISTRIBUTION POINTS FROM PROPOSED PLANT SITE AND CLOSEST EXISTING COMPETITION (Based on Fixed Common Carrier Rates)

Distribution Point	From Closest Competition		From Bristol-Blountstown	Advantage
	Bricks (Per 1000)			
Dothan, Ala.	Columbus, Ga.	$ 20.00	$ 18.00	$ -2.00
Bainbridge, Ga.	Columbus, Ga.	22.80	20.00	-2.80
Moultrie, Ga.	Columbus, Ga.	23.20	23.20	-0-
Valdosta, Ga.	Macon, Ga.	24.40	24.40	-0-
Jacksonville, Fla.	Macon, Ga.	30.00	25.40	-4.60
Gainesville, Fla.	Macon, Ga.	31.20	24.20	-7.00
Ocala, Fla.	Macon, Ga.	33.20	25.40	-7.80
Tallahassee, Fla.	Columbus, Ga.	25.20	11.00	-14.20
Panama City, Fla.	Barth, Fla.	19.20	11.00	8.20
DeFuniak Springs, Fla.	Barth, Fla.	15.80	15.00	-.80
	Drain Tile (Per Ton)			
Dothan, Ala.	Columbus, Ga.	$ 10.00	$ 9.00	-1.00
Bainbridge, Ga.	Columbus, Ga.	11.40	11.00	-.40
Moultrie, Ga.	Columbus, Ga.	12.20	11.60	-.60
Valdosta, Ga.	Columbus, Ga.	12.80	12.20	-.60
Jacksonville, Fla.	Harlem, Ga.	15.60	12.70	-2.90
Gainesville, Fla.	Harlem, Ga.	16.00	12.10	-3.90

TABLE 9 continued

Distribution Point	From Closest Competition		From Bristol-Blountstown	Advantage
	Drain Tile (Per Ton) continued			
Ocala, Fla.	Harlem, Ga.	$ 17.00	$ 12.70	$ -4.30
Tallahassee, Fla.	Columbus, Ga.	12.70	5.50	-7.20
Panama City, Fla.	Fairhope, Ala.	14.00	5.50	-8.50
DeFuniak Springs, Fla.	Fairhope, Ala.	11.20	7.50	-3.70

Becuase rail transportation may very well be employed under certain circumstances, especially in supplying such distant points as Jacksonville, Gainesville and Ocala, a comparison of published rates for this type of carrier is presented in the following table.

TABLE 10

RAIL TRANSPORTATION COST ADVANTAGE TO PRIMARY MARKET DISTRIBUTION POINTS FROM PROPOSED PLANT SITE AND CLOSEST EXISTING COMPETITION

Distribution Point	From Closest Competition		From Bristol-Blountstown	Advantage
Dothan, Ala.	Columbus, Ga.	$ 8.20	$ 7.90	-.30
Bainbridge, Ga.	Columbus, Ga.	8.20	7.80	-.40
Moultrie, Ga.	Columbus, Ga.	8.20	8.20	-0-
Valdosta, Ga.	Macon, Ga.	9.40	9.40	-0-
Jacksonville, Fla.	Macon, Ga.	10.20	10.20	-0-
Gainesville, Fla.	Macon, Ga.	13.00	11.80	-1.20
Ocala, Fla.	Macon, Ga.	13.40	13.00	-.40
Tallahassee, Fla.	Columbus, Ga.	9.40	7.80	-1.60
Panama City, Fla.	Barth, Fla.	9.80	7.80	-2.00
DeFuniak Springs, Fla.	Barth, Fla.	8.10	8.00	-.10
	Drain Tile (Per Ton)			
Dothan, Ala.	Columbus, Ga.	7.20	6.20	-1.00
Bainbridge, Ga.	Columbus, Ga.	7.50	6.50	-1.00
Moultrie, Ga.	Columbus, Ga.	7.90	7.50	-.40
Valdosta, Ga.	Columbus, Ga.	8.30	7.90	-.40
Jacksonville, Fla.	Harlem, Ga.	9.90	9.70	-.20
Gainesville, Fla.	Harlem, Ga.	10.30	9.70	-.60
Ocala, Fla.	Harlem, Ga.	10.90	10.30	-.60
Tallahassee, Fla.	Columbus, Ga.	8.10	6.50	-1.60
Panama City, Fla.	Fairhope, Ala.	9.10	6.50	-2.60
De Funiak Springs, Fla.	Fairhope, Ala.	7.70	7.00	-.70

Although differing considerably from one method of transportation to another, these several comparisons of probable freight costs all are in substantial agreement as to the relative advantage which a Bristol-Blountstown plant could be expected to enjoy in the primary market area. There are a very few exceptions in the case of common carrier transportation, due to the structure of published rate schedules. These exceptions would have little effect in the total marketing picture, however, because of the probable major reliance on transportation other than common carrier.

The secondary market area - Since the secondary market area is from 350 to 450 miles from existing sources of supply, and would be from 250 to 350 miles from the proposed Bristol-Blountstown plant, the question here is not so much one of competition between sources of structural clay products, but one of competition between structural clay products and locally available alternative products. With almost a hundred mile distance advantage over the closest existing competition, the Bristol-Blountstown site would obviously be in an excellent position to invade this market. At this distance, however, the advantage in actual mileage represents very little advantage in freight rates, as the following figures will bear out.

Rail Freight Costs per 1000 Bricks to Tampa
(1000 brick=4000 lbs)

From	
Bristol-Blountstown	$14.20
Closest existing source	14.60

Truck transportation costs at this distance run too high to leave the commodity competitive with concrete products, as revealed below.

Truck Freight Costs per 1000 Bricks to Tampa
(1000 bricks=4000 lbs)

From	Common Carrier	Company Controlled Carrier (@ 3¢ ton/mile)
Bristol-Blountstown	$ 30.00	$ 17.52
Closest existing source	36.80	22.98

In order to most effectively exploit the secondary market area, it will thus be necessary to deliver the structural clay commodities at a lower overall cost. This brings up the possibility of using barge transportation from the Bristol-Blountstown site, and the establishment of a major distribution center at Tampa in much the same manner as the Augusta Merry Brothers frim has done so successfully at Jacksonville. From the Tampa port, the rapidly growing area within approximately a 50 mile radius could be served by truck transportation,

staying well within the cost dictated by the economics involved.

In order to utilize barge transportation from the Bristol-Blountstown site, several conditions must be fulfilled. Barge operators now equipped to handle brick shipments from the Bristol-Blountstown area to the Port of Tampa have indicated that shipments could be made at a cost of $1.50 to $2.00 per ton, exclusive of port charges, provided that: (1) a return cargo was available, (2) sufficient work is continued in the Apalachicola River to maintain an adequate channel depth, (3) approval is granted to the carrier by the appropriate regulatory agency, and (4) adequate facilities for docking and loading are made available.

It appears that all of these conditions could be met. The shipment of phosphate fertilizer would seem to offer a possibility as a return cargo. Channel depth in the river is now maintained at eight feet and contracts have been let to increase the controlling depth to nine feet. At present no bricks are shipped on the river and it is not known whether the Interstate Commerce Commission would claim jurisdiction over barges travelling outside the territorial waters of Florida or whether such shipments would be regulated by the State. Docking and loading facilities would have to be made available, either by municipal port authorities or by the plant owners.

Assuming that the necessary conditions are met, it would appear that brick could be barged to a Tampa distributing point for a cost of $5.00 to $6.00 per thousand, as compared with $14.20 for rail and $17.52 for truck. Similar savings could be realized for drain tile. Brick could then be delivered by truck to points within a fifty mile radius at an additional cost of $3.00 to $4.00. Even with the additional costs of a yard or other storage facilities in Tampa, the total delivered cost of the product by the barge-truck method should still undercut existing costs enough to enable the capture of a large portion of the present brick and drain tile market in the secondary market area. Perhaps even more important, it would place these clay products in a far better position to compete with similar concrete products which are now used extensively in the area.

Although there is no experience on which to base a firm conclusion, the possibilities offered by this method of serving the secondary market area appear sufficiently real to justify full consideration as a part of the overall marketing feasibility for a Bristol-Blountstown plant.

Estimate of Probable Market Share

In the foregoing analysis, a primary and a secondary market area for a Bristol-Blountstown structural clay products plant were identified - largely on the basis of transportation factors. Two products, brick and drain tile, were selected on the basis of demand as offering the greatest possibilities for establishment of a

successful industry. Current actual demand for these two commodities was estimated at 100,000,000 bricks per year and 1,500,000 feet of drain tile per year for the two market areas combined. Before final marketing feasibility can be established, a careful estimate must be made of the amount of this demand which can reasonably be expected to be captured by a new plant operating from the Bristol-Blountstown site.

For the purpose of estimating probable marketing success, comparative commodity prices - as influenced in this case by the important variable of transportation costs - offer the most reliable indication. Even within the area where a Bristol-Blountstown plant has a distinct transportation cost advantage, however, there are two circumstances which render capture of the entire market impossible from a practical standpoint. First, the wide diversity of products on the brick market militates against a single plant with a broad enough operation to satisfy all requirements. Second, in cases where an acceptable product is available from more than one supplier, countless unpredictable factors will influence the buyer's choice. Some allowance, based on established preferences in the area, can be made for the first situation, but the relative importance of the second cannot be evaluated in quantitative terms.

Bricks - For the primary market area, consideration may be given separately to urban Jacksonville, on the one hand, and the scattered rural distribution points making up the rest of the area, on the other hand. In both cases it would be reasonable to assume that at least twenty percent of the brick market will require types which will not be supplied from a Bristol-Blountstown plant.

This allowance would not include used brick, however, because this product - although extremely popular in the area at present - was excluded from the current consumption figures estimated herein.

Because of the intense competition for the concentrated Jacksonville market, the advantage of barge transportation enjoyed by Augusta plants, and the relatively small land transportation cost advantage which Bristol-Blountstown would have over existing competitors, it is unlikely that the proposed plant could expect more than about 10 percent success in competing for the Jacksonville market. The estimated probable share of this market would thus be on the order of 4,000,000 bricks per year.

In the rest of the primary market area, because of greater transportation cost advantages and less intensive competition in the smaller distribution points, it is expected that a Bristol-Blountstown plant would be far more successful. The total probable share of this market could average out as high as 50 percent of the products for which the plant was capable of competing, or about 10,000,000 bricks per year. The estimated total market for bricks to be served by a Bristol-Blountstown plant in the primary market area would be about 14,000,000 units per year.

In the secondary market area, the demand is concentrated in the Tampa-St. Petersburg locality, and an effective barge transportation

system should provide a Bristol-Blountstown plant with a highly competitive position. With such an advantage, the proposed plant should be able to undercut the present suppliers and capture at least sixty percent of the available market. Allowing twenty percent for brick products outside the line of a Bristol-Blountstown plant, the net market share would be about 12,000,000 units per year. On the other hand, if rail rather than barge transportation were used to supply this market area, the probable market share would be reduced by possibly fifty percent, or to a total of some 6,000,000 bricks per year.

From this analysis, it would thus appear that the probable share of the combined brick markets likely to be captured by a Bristol-Blountstown plant would be about 26,000,000 units per year if barge transportation were effectively employed, or about 20,000,000 units per year otherwise. This would represent twenty to twenty-six percent of the total estimated brick demand in the two market areas. This is considered a conservative figure.

Drain tile - Total drain tile demand for the two market areas was estimated at 1,500,000 linear feet per year. Of this amount, about 600,000 linear feet is attributable to the primary market area. Because almost all of this commodity presently distributed in the area is shipped by truck, the proximity of plant to market takes on additional importance. It is probable that, with its decided transportation advantage, a Bristol-Blountstown plant could command virtually all of the market, with the exception of the distribution points along the northern perimeter of the market area. The probable share of this market which could reasonably be assigned to a Bristol-Blountstown plant would be on the order of 75 percent, or about 450,000 linear feet of drain tile per year.

For the secondary market area, the advantage of cheaper barge transportation for marketing drain tile would still be important, but less so than in the case of bricks. Because the demand for this commodity is of considerably less volume, there would be little justification for maintaining as large stockpiles in the area. In addition, much of the demand would be widely scattered throughout the entire secondary market area, as opposed to being concentrated near the port of Tampa as in the case of bricks. Even without the advantage of significantly reduced transportation costs, however, a Bristol-Blountstown plant would enjoy a slightly better competitive position than any of the several major existing plants now supplying this market. For this reason, it should be able to capture at least 40 percent of the market for a probably share of some 360,000 linear feet per year.

The combined shares of the primary and secondary market areas would produce a total market of about 810,000 linear feet of drain tile per year for a Bristol-Blountstown plant.

Estimates of probable share for both the brick and drain tile market are summarized in the table below.

TABLE 11

ESTIMATED PROBABLE SHARE OF THE
CURRENT BRICK AND DRAIN TILE MARKET
TO BE SERVED BY A BRISTOL-BLOUNTSTOWN PLANT

	Brick (Units)		Drain Tile (Linear Feet)	
	Current Demand	Bristol-Blountstown Share	Current Demand	Bristol-Blountstown Share
Primary Market Area	75,000,000	14,000,000	600,000	450,000
Secondary Market Area	25,000,000	12,000,000	900,000	360,000
Total	100,000,000	26,000,000	1,500,000	810,000

Possibilities for Expanding the Present Market

There are two distinct possibilities for immediately expanding the market available to a Bristol-Blountstown plant. One of these involves an increase in demand, and the other an enlargement of the market area to be served. Both are discussed briefly below.

Increasing the demand - Analysis shows that the primary market area is well supplied with structural clay products and that these products enjoy a relatively strong competitive position in the building materials market. As a result, clay products such as brick and drain tile are used extensively, with the limitation to greater use being primarily one of consumer preference. Unless some development takes place to alter the status quo, the present level of demand will continue to represent very nearly the saturation point for the clay products market in this area.

Such is not the case in the secondary market area, however. Here, the relatively minor consumption of structural clay products is a direct result of competitive pressure from concrete products, which are manufactured extensively in the area. Incidental to this economic disadvantage, an artificial barrier to wider use of clay products has developed. Architects, builders and individual consumers in the area appear frequently to refrain from considering clay products because of a prevalent attitude that such products are prohibitively expensive. As a result, concrete products have been able to exploit the masonry construction market even beyond the point which the relative economics would indicate.

Provision of a new source of supply for clay products on a more competitive basis, combined with aggressive promotional efforts,

would result in a substantial increase in the present level of demand in the secondary market area. The rate of brick consumption in this area is less than half that of the primary market area, despite a much faster growth rate and a correspondingly active construction market. With the favorable developments mentioned, it would not be unreasonable to expect a volume increase in brick consumption in the secondary market area. The rate of brick consumption in this area is less than half that of the primary market area, despite a much faster growth rate and a correspondingly active construction market. With the favorable developments mentioned, it would not be unreasonable to expect a volume increase in brick consumption in the secondary market area of 10,000,000 - 15,000,000 units per year over the first five to ten years of operation. For planning purposes, it would be safe to assign an additional 5,000,000 units per year to the initially available market, assuming that the advantages of barge transportation materialized. Even without barge transportation, the demand in the secondary market area could be stimulated considerably by active promotion of brick and other structural clay products.

Enlarging the market area - At the present time there is a demand of about 20,000,000 to 25,000,000 bricks per year in the area of the Florida peninsula south of the primary market area and east of the secondary market area. This part of Florida is growing at an extremely rapid rate, giving rise to one of the largest construction markets in the country. Because bricks are used primarily for architectural variety, however, the demand for this commodity has not kept pace with the general upward trend of the area.

Still, the total volume of brick usage is considerable, and to the extent that this demand could be met with products produced at a Bristol-Blountstown plant, such a plant would be in a position to compete favorably with existing suppliers for this additional market. In effect, this area provides a tertiary market area available to a Bristol-Blountstown plant, and might be worthy of more detailed attention except for two potentially limiting factors. First, since bricks have to be brought in from such distant sources, a wide variety of choice is exercised by users, making it unlikely that a single plant could demand a significantly large share of the market. Second, the demand in the area is concentrated primarily along the Atlantic coast, making the market subject to potential exploitation by means of the Atlantic Intracoastal Waterway system, should the demand rise to a high enough level to justify such operations. According to various reports, unconfirmed at present, serious attention is already being given to the feasibility of barging brick to Sanford, Florida, the head of navigation on the St. Johns River. This would serve as an excellent distributing point from which to supply the rapidly growing Orlando-Cape Canaveral area.

Although the south Florida area is not considered a highly productive market, it is probable that an additional 2,000,000 to 2,500,000 bricks per year could be marketed here by a Bristol-Blountstown plant. There is every reason to suspect, however, that the

competitive position of the Bristol-Blountstown site relative to this area will decrease rather than increase with further developments in the structural clay products industry.

Conclusion as to Sufficiency of Market

If all marketing possibilities are aggressively exploited, a market of 30 to 35 million bricks per year and approximately one million linear feet of drain tile per year should be available to a Bristol-Blountstown plant. A plant of this capacity would be somewhat larger than the national average and considerably larger than a number of the plants currently serving this market area. There appears to be no reason why a plant of this size cannot operate on an economical basis and turn out a suitable product at a competitive cost.

Prospects for Future Growth in the Structural Clay Products Industry

As a result of the sharp decline in sales and use of major structural clay products over the past decade, several steps have been taken, on an industry-wide basis, to revitalize the industry by means of research and development and more effective promotion and marketing.

Two organizations, The Structural Clay Products Institute and The Structural Clay Research Foundation, have been active in disseminating information, organizing and assisting in promotional and marketing campaigns, ans research and development of new products and processes. In addition to the efforts of these organizations, the industry is served by trade journals which regularly report on advances in technology, new products, and other items of interest to the industry.

The efforts of these organizations have been rewarded by the development and promotion of several new products and processes which could ultimately result in a much wider use of clay products in the construction industry. The continued development of new products offering a wider possibility of uses and new processes aimed at achieving lower unit production costs, lower delivered costs, and lower building costs should do much to improve the economic outlook of the industry.

Among the new products currently available or under development are various types of building panels such as the "SCR building panel". The panel is 2-1/2 inches thick and may be obtained in a wide variety of colors and finishes of brick, tile or terra cotta. The panels can be made in a variety of sizes up to 24 inches wide and 13 feet 4 inches in length. The panel can be used as a load-bearing wall or as a component for shear-walls and plate girders. (Structural Clay Products Institute, 1962).

Recent research in Portland Cement mortars has indicated that additives will soon be available to increase the strength of these mortars and provide a four-fold increase in the tensile bond between brick and mortar. This will permit the use of four-inch load-bearing walls where eight inch walls are now required (Structural Clay Products Institute, 1962).

The development of lightweight units such as "SCR veri-lite"*, a low-density clay aggregate of uniform particle size added to conventional clay will produce structural units with a weight reduction of approximately 40 percent. This process is now in the pilot-plant stage of development (Structural Clay Products Institute, 1962).

Clay acoustical tile units are also available - these are hollow, perforated, single or double faced units filled with glass fibers. They are highly fire resistant, require no painting, and are easily cleaned.

In addition to the new products mentioned above, extensive research has been conducted in brick packaging in an effort to reduce loading and handling costs. The work of the Structural Clay Products Research Foundation resulted in a completely automatic packaging operation, which, though not practical except when the entire production operation is automated, has led to development of semi-automated packaging lines adaptable to current production processes. (Structural Clay Products Research Foundation, Personal Communication, August 19, 1963.)

From the above indications of the research, development, and promotional activities currently in progress, it seems clear that the industry is engaged in an aggressive attempt to make the most of the numerous advantages offered by clay products, to broaden the scope of possible uses of clay products, and to eliminate or reduce the difficulties in handling, packaging, transporting and construction which have prevented wider use of clay products.

As these developments materialize, they will further enhance marketing possibilities for a Bristol-Blountstown plant.

CONCLUSIONS

On the basis of the foregoing analysis, it is possible to draw several significant conclusions relative to the market potential and the marketing prospects for a structural clay products plant in Redevelopment Area A, in northwest Florida.

1. While the production of major structural clay products has been generally static in the national picture during the past decade, the three-state region embracing the market area for a plant

* Reg. U. S. Pat. Off., Pat. Pend., Structural Clay Products Research Foundation

in Redevelopment Area A has shown a slight increase in percentage of national production over the same period.

2. In the regional picture, the structural clay products industry is concentrated in Alabama and Georgia, with brick, structural tile and drain tile being the principal commodities produced.

3. High transportation costs and competition in the surrounding states restricts marketing of regional production largely to the three-state area, where consumption has been gaining slightly in recent years.

4. Although regional production capacity is already somewhat in excess of the market demend, the absence of plants in Florida and the long distances which products are now shipped to serve this area would appear to be justification for a plant in Redevelopment Area A. Because of the availability of raw material, a source of power, and waterborne transportation, the Bristol-Blountstown vicinity would afford a logical plant site.

5. Because of the advantage of lower transportation costs, a Bristol-Blountstown plant could compete successfully for a large share of the structural clay products market in northern Florida, southeastern Alabama and southern Georgia; but successful marketing in peninsular Florida would be limited by competition from locally produced alternative products - primarily concrete - and by a proportionally decreasing transportation advantage over existing clay products plants.

6. The development of an effective barge transportation system would enable exploitation of a secondary market area in the Tampa-St. Petersburg vicinity because of considerably reduced transportation costs.

7. Bricks and drain tile are the two structural clay products offering the greatest marketing possibilities in the two market areas; structural tile, quarry tile and lightweight clay aggregate have too little demand at present to justify an additional manufacturing plant in the region.

8. Of a present estimated demand of 100,000,000 bricks per year and 1,500,000 linear feet of drain tile per

year in the combined market areas, a Bristol-Blountstown plant should be able to capture a share of this market amounting to about 26,000,000 bricks per year and 810,000 linear feet of drain tile per year.

9. Barge transportation should enable a Bristol-Blountstown plant to undercut present prices of clay products sufficiently in the secondary market area to promote greater use of these products at the expense of concrete products; this probability, and the development of the limited market potential of southern Florida, should increase the total market for a Bristol-Blountstown plant by some 7,000,000 bricks per year and a small amount of drain tile.

10. The total market potential for a Bristol-Blountstown plant is estimated at 30,000,000 to 35,000,000 bricks per year and about 1,000,000 linear feet of drain tile. This market would support a plant of a capacity greater than the national average and considerably greater than a number of plants now serving this market area.

11. The development of a structural clay products plant in the Bristol-Blountstown vicinity of Redevelopment Area A, to product common varieties of brick and drain tile, is considered justified on the basis of present marketing prospects.

12. Because of active steps being taken within the structural clay products industry as a whole, it is probable that the consumption and use rates for these commodities will stabilize and increase somewhat in the years ahead, placing the entire industry on a healthier economic footing.

PART II RAW MATERIALS

LOCATION AND DESCRIPTION OF DEPOSITS

Occurrence of Clay Deposits Within Redevelopment Area A.

Deposits of clay which have shown promise of being suitable for commercial use have been known to be present in Redevelopment Area A almost from the earliest days of geological investigation in Florida. The clay deposits which seem to be the most promising are located along the banks of the Apalachicola River, in Liberty and Calhoun Counties (Figure 6). Other clays have been reported at various localities throughout Area A, but none of these have proved to be of commercial value (Calver, 1949; Lang, 1940).

Although bricks have been made in northwest Florida since the days of the earliest settlements, these operations have been based on small deposits of local raw materials, hand labor, and equipment which by today's standards would be considered antiquated. None of these operations are presently active.

The last known producer of bricks within Area A was located near Chipley, in Washington County. This plant ceased operations during World War II, and much of the plant and equipment still remains at the site. The deposit at this location previously described in a similar feasibility study (George Aase & Associates, 1962), and, while the clay appears to be of excellent quality, the deposit is limited in extent and has already been extensively mined.

Therefore, on the basis of present knowledge of the clay deposits of northwest Florida, it appears that the area most likely to have sufficient reserves of suitable clay to sustain a modern structural clay products industry is the Liberty-Calhoun County area.

Previous Work - Liberty and Calhoun Counties

The presence of clay deposits in Liberty and Calhoun Counties has been known at least since 1924 (Bell, 1924, p. 181-3). Bell's work indicated that the clays were of excellent quality for brick and other products, but the wide distribution of sizable clay deposits in the area was apparently not fully appreciated until much later.

In 1956 and 1957, an investigation was conducted by a consulting geologist for a private landowner in Calhoun County (Buie, 1957), and the report concluded that a clay deposit of commercial extent and quality was unquestionably available. Sample bricks were made in a commercial brick plant, and both the samples and the consultant's report have been made available for use in compiling this report.

In 1960, a local group from Liberty County conducted a limited

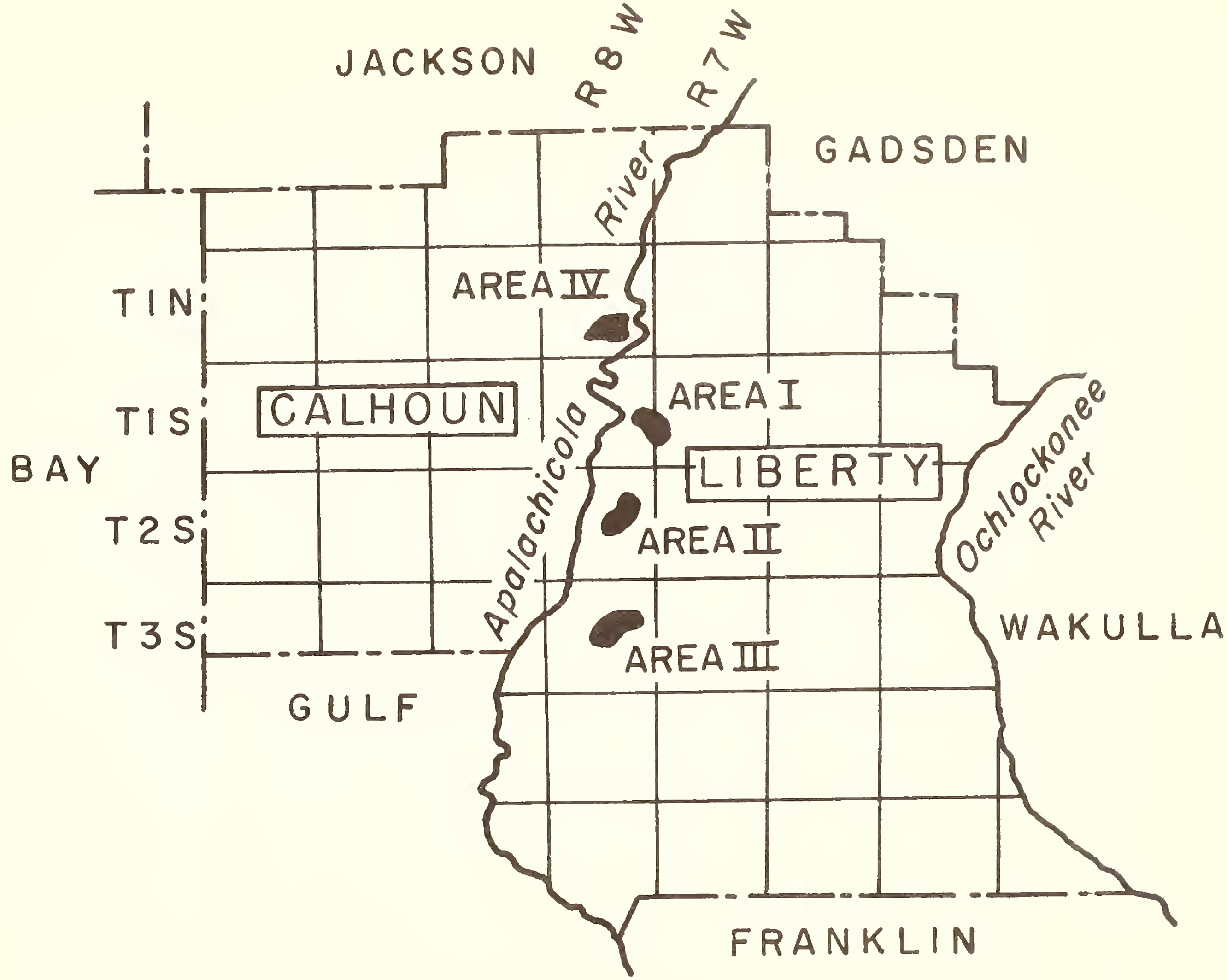


Figure 6 Liberty and Calhoun Counties Showing Location of Clay Deposits.

drilling program to obtain preliminary information on the extent of several suspected clay deposits. The drilling program was witnessed by Mr. W. D. Reves of the Florida Geological Survey. The results of this drilling suggested the presence of at least three deposits of possible commercial extent. Samples were tested and test bricks made by a private concern interested in developing the deposit. None of this information has even been made available, but it is said that results were favorable. A limited number of extra samples from this program were given to the Florida Geological Survey and sent to the U. S. Bureau of Mines for testing. The results of this work are expected to become available as part of a minerals inventory of the State of Florida currently in preperation.

In 1962, the above mentioned deposits in Liberty County were sampled and tested to determine their suitability for use as a source of silica and alumina in Portland Cement manufacture (George Aase & Associates, 1962). This sampling program was also limited, and since only chemical analyses were performed, very little information pertaining to the use of the deposits for structural clay products was obtained.

Criteria for Sampling and Testing

Previous work, though largely unpublished and generally unavailable, indicated the presence of several clay deposits of possible commercial value in Liberty County, and at least one such deposit in Calhoun County. The cost of drilling and laboratory testing of clays made it clear from the start that a complete program of sampling and testing of each deposit would be impossible. It was therefore decided that sampling would be limited to those deposits which were favored by transportation and other advantages, and to those deposits for which useful information was not available.

Using these criteria, samples were collected from three localities in Liberty County. The single known locality in Calhoun County was not sampled because of the availability of a recent (1957) consultant's report which presented the results of an extensive preliminary sampling and testing program. These results will be summarized in this report.

Sampling Methods and Sample Design

Previous experiences in sampling the clay deposits of this area indicated that obtaining samples would present a problem, since the clay in its natural state is extremely dense and virtually impossible to penetrate with a hand auger. The possibility of using rotary drilling methods was considered, but rejected because of the high cost involved. The problem of obtaining samples was finally solved by building a portable drilling rig, consisting of a heavy-duty half-inch electric drill, powered by a 110 volt, 15 amp., gasoline-driven, electric generator. A four-inch post hole auger bit, with various lengths of drill rod, was driven by the electric drill.

This device, in most cases, provided sufficient power to penetrate

the clay strata, and the various lengths of drill rod permitted operation of the drill at a convenient height above ground, regardless of the depth of the hole. The post-hole auger was removed from the hole when full and the exact depth of sample could easily be determined by measurement each time the auger was removed from the hole.

In addition to those obtained by drilling, samples were collected at two road cuts. One of these sites was a newly exposed section of the clay strata along a highway construction project, and the other was an older exposure along a secondary road. In each of these cases, fresh, unweathered samples were obtained by removal of surface material and sampling of unexposed clay.

A sample design was developed to accomplish two purposes: (1) to provide additional information that could be used in combination with the data gathered previously by local interests in determining the extent and confirming the continuity of the deposits, and (2) to provide samples for laboratory testing from each of the deposits to determine quality and to evaluate any possible changes in quality either horizontally or vertically within the deposit.

Because the work conducted by local interests, and witnessed by the Florida Geological Survey, presented reliable - but sparse and widely spaced - data on the thickness and extent of two of the deposits, it was a simple matter to plan a sampling program which would provide additional data to indicate the presence of deposits of commercial thickness or extent.

The second objective, and probably the most important because of a lack of previous information, was the determination of quality and determination of any possible variation, either vertically or horizontally within the deposits. To achieve this objective, samples for testing were selected in the following manner:

1. At each locality a representative sample of the entire thickness of the strata penetrated was preserved for laboratory testing. This procedure would give an indication of quality of material if the entire thickness of clay were to be mined as would be done in an efficient low-cost mining operation.
2. In addition to preserving a representative portion of the entire sample, certain depth intervals of some samples were preserved for separate testing where visual examination indicated the possibility of changes in physical properties with depth.

Specific sampling procedures for each locality will be discussed in detail below.

Objectives of the Test Program

The objectives of the test program are:

1. To determine the quality of the clay as a raw material for use in the structural clay products industry.

2. To determine any significant variations in quality between separate deposits and within each deposit.

To achieve these objectives, a series of laboratory tests (described in detail below) was performed on each collected sample - a total of twelve samples in three separate areas. It should again be emphasized that the testing program was intended only to be a preliminary program to indicate whether further detailed exploration and pilot plant testing should be undertaken.

The results of tests conducted in Area IV, Calhoun County, during a previous investigation (Buie, 1957) are also discussed in this section

Description of the Testing Program

The series of tests conducted during this investigation consisted of a number of laboratory tests to determine:

1. Physical characteristics of the raw materials, to give an indication of handling qualities of the raw materials and other factors having a bearing on the behavior of the materials during manufacturing.

2. Chemical analysis of the raw materials, to provide data on chemical composition and to indicate the presence of impurities and coloring matter.

3. Physical properties of fired samples, for the purpose of determining whether the products to be manufactured will meet existing specifications for various products and to compare the quality of the finished product with that of similar products manufactured elsewhere.

The tests conducted are listed below along with a brief discussion of the significance of each, and the ranges of value which are acceptable for structural clay products.

Plasticity - Values for plasticity, the transverse strength or modulus of rupture of the material in the plastic state (with sufficient water to render the clay suitable for extrusion) is given in pounds per square inch. Plastic strength should be sufficient to prevent warping or deformation during the extrusion or drying process. Acceptable ranges of plasticity vary widely with different types of processing equipment and for different products, and for this reason plasticity is also described as acceptable or not acceptable.

Dry Shrinkage - Dry shrinkage is the percentage of linear

shrinking of a product from the time it is extruded or shaped until it is ready for firing. Dry shrinkage alone is not usually a limiting factor in the use of clay for structural products, because the total shrinkage, during both drying and firing, is of greater importance. The total drying and firing shrinkage should not exceed 16 percent, and the clay should dry without warping or cracking. A relatively consistent rate of shrinkage is desirable in order to insure that dimensional control of the product is sufficient to meet specifications.

Dry Strength - Dry strength is the transverse strength or modulus of rupture of the extruded, or shaped, unfired product, in pounds per square inch. For ease of handling without undue danger of breakage, the dry strength of a brick clay should exceed 70 pounds per square inch.

Firing Temperature - The firing temperature or firing range of a clay is the temperature or temperature range at which the clay changes or vitrifies into brick, tile or other similar materials. Commercial firing ranges are between 1800° and 2400° Fahrenheit. Clays which develop desirable characteristics at low temperatures are preferred because of the low consumption of fuel in the manufacturing process. A rather wide range of temperatures in which desirable qualities develop is also preferred, since this eliminates the necessity of critical temperature control. Each of the tests discussed below were performed on clays fired over a range of temperature from 1950° to 2250° Fahrenheit.

Fired Shrinkage - The percent of linear shrinkage during firing is the fired shrinkage. As mentioned earlier, total shrinkage - the combined drying and firing shrinkage - should not exceed 16 percent for use in brick or drain tile manufacture.

Fired Strength - The fired strength of the finished product, or mudulus of rupture, is the transverse strength, expressed in pounds per square inch. This value should exceed 600 pounds per square inch for building brick, 2000 pounds per square inch for hollow tile or sewer pipe, 1200 pounds per square inch for drain tile, and 2700 pounds per square inch for quarry or floor tile.

Absorption - Water absorption is important in cold climates as an indication of resistance to freezing and thawing in the production of brick and hollow tile. For other products, specifications usually call for a maximum total absorption, such as less than 16 percent for drain tile and not more than 8 percent for sewer pipe. Other measures of absorption such as the C/B ratio, have been devised to give an indication of resistance to freezing and thawing better than that provided by total water absorption. The C/B ratio, or saturation coefficient, is the ratio of absorption after 24 hours of submersion in cold water to the absorption after 5 hours submersion in boiling water. This gives the ratio of easily accessible pore space to total pore space, and thus is usually an effective measure of resistance to freezing and thawing.

However, when total absorption is low (less than 8 percent), the material may have an unfavorable C/B ratio and still be quite resistant to freezing. Products which will be subject to freezing while saturated should have a C/B ratio of less than 0.78. For less severe conditions, or for interior use, a higher ratio is generally acceptable.

Area I - Liberty County

Location - Area I is located on Sections 25, 26, 35, and 36, of Township 1 South, Range 8 West, approximately six miles south of Bristol, Florida (Figure 7).

Description of Area - Most of the area is currently in use as pasture, with bordering areas planted in pine trees. The area is of generally flat topography and has a minimum elevation of fifty feet above sea level, sufficiently to eliminate the possibility of flooding from the nearby Apalachicola River.

Previous Work - Three cores were taken from this area by a group of local citizens in 1960. These cores indicated the presence of a large clay deposit of considerable thickness. Approximate locations of these holes (numbered I through III are shown on Figure 7. The clay sections penetrated in these holes were 12.5, 14.5 and 5.5 feet in thickness, respectively.

Sampling Procedure - Three holes were drilled in Area I during this investigation to obtain material for testing and to provide additional information on the extend of the deposit. The locations of these holes are shown on Figure 7 and logs of the holes are presented in Appendix I. A total of six samples were prepared for testing from material collected in this area. The material to be tested is described below:

Sample Designation	Sample Location	Sample Depth	Remarks
A	Hole No. 1	1-10'	Total section of clay penetrated in hole
B	Hole No. 1	1-4'	
C	Hole No. 1	4-7'	
D	Hole No. 1	7-10'	
E	Hole No. 2	4-7'	Total depth-7'
F	Hole No. 3	2.6'	Total depth-6'

Only in Hole No. 1 was a thick section of clay penetrated. In Holes No. 2 and No. 3 drilling had to be abandoned at shallower depth because of the inability of the equipment to penetrate to

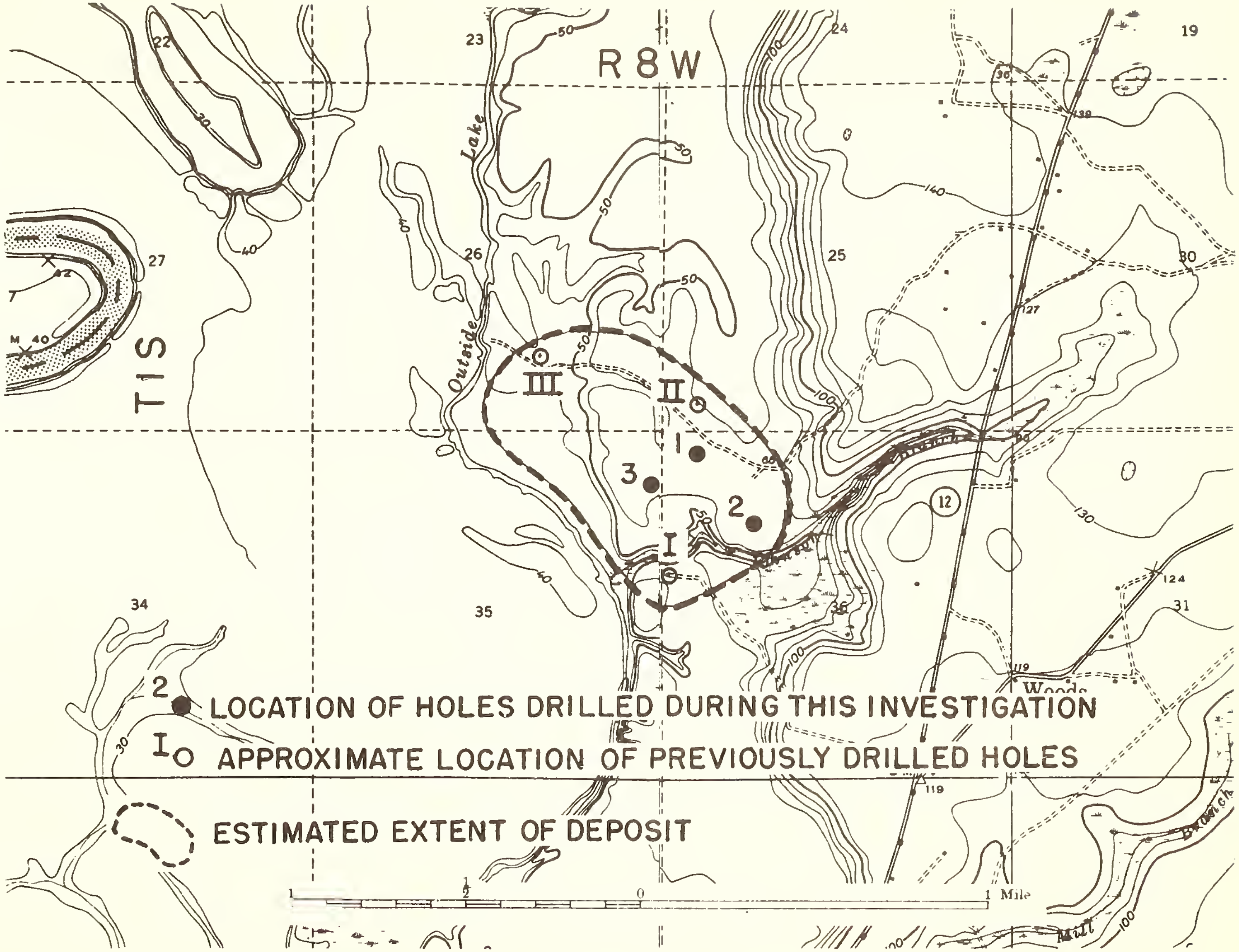


Figure 7   Location of Area I, Liberty County.

greater depth. With the information available from the earlier drilling program, however, a preliminary estimate of the extent of the deposit is possible, as is a determination of the physical and chemical properties of the clay.

Tests were made of the entire sections of clay recovered from each hole (Samples A, E and F). In addition, the nine foot section of clay recovered in Hole No. 1 was split into three depth intervals, corresponding to superficial physical differences (primarily color, but with some apparent minor changes in silt and sand content). Further tests were made of the clay from each interval to determine whether any significant differences in quality exist with depth in the deposit.

Quality - Visual examination of the samples obtained during drilling indicates that the clay is plastic, slightly silty, generally free from sand-or contains only minor percentages of sand-and varies in color from yellow to red to gray. A relationship of color to depth appears to exist, although not consistently throughout the area. The yellow clay, possibly weathered, lies closest to the surface and is underlain by gray or red and gray mottled clay. Other than color differences - which may be due to weathering of minor constituents - and slight variations in sand and silt content, there was no reason to expect that significant quality differences exist, either vertically or horizontally, throughout the deposit. This appears to be confirmed by the results of the tests which are discussed in a later section of the report.

Reserves - The deposit is estimated to cover approximately 280 acres. Overburden varies from one to four feet, and the thickness, where fully determined, ranges from 5.5 to 12.5 feet.

The deposit is estimated conservatively to contain over 4 million cubic yards of clay, or 6 to 8 million tons.

While further drilling will be necessary to confirm the continuity of the deposit and permit more accurate estimates of reserves, it is possible that additional work will show the deposit to contain reserves considerably in excess of the above figures.

Results of Testing Program - Six samples were submitted for testing from Area I. The locations of these samples are shown on Figure 7 (Locations 1, 2 and 3). Sample A represents the entire thickness of clay penetrated at location No. 1; samples B, C and D represent the upper, middle and lower parts, respectively, of the clay stratum at location No. 1; sample E represents the entire thickness of clay from location No. 2; and sample F represents all clay collected from location No. 3. Clays from each sample were fired up to four times, at temperatures ranging from 1950° to 2250°F. A tabulated summary of the physical test data is given below:

Summary of Physical Tests - Area I - Liberty County

Sample No.	Firing Temp.(°F)	Plasticity PSI	% Dry Shrinkage	% Fired Shrinkage	% Total Shrinkage
	1950	79.7	4.7	2.3	7.0
	2050			4.8	9.5
A	2150			5.1	9.8
	2250			5.4	10.1
	1950	52.9	4.9	2.9	7.8
	2050			4.3	9.2
B	2150			4.7	9.6
	2250			4.9	9.8
	1950	62.1	6.0	1.8	7.8
	2050			4.6	10.6
C	2150			5.0	11.0
	2250			5.1	11.1
	1950	48.8	6.2	2.1	8.3
	2050			4.1	10.3
D	2150			4.7	10.9
	2250			5.2	11.4
	1950	45.4	5.8	1.3	7.1
	2050			2.6	8.4
E	2150			3.9	9.7
	2250	I.S.*		I.S*	I.S*
	1950	56.0	6.0	2.6	8.6
	2050			5.4	11.4
F	2150			6.1	12.1
	2250			5.5	11.5

* Insufficient Sample

Summary of Physical Tests (Continued)

Sample No.	Dry Strength (Modulus of Rupture)	Fired Strength (M.R.)	ASTM* Absorption 24 hr.	ASTM* Absorption Total	C/B Ratio	Firing Range(°F)
	641	1659	14.4	16.7	0.86	
		2290	10.3	13.8	0.75	
A		2110	8.7	12.4	0.74	2050 to
		2310	8.1	12.4	0.66	2250
	396	1062	17.2	19.4	0.89	
		1620	12.6	16.2	0.78	
B		1550	11.6	15.4	0.75	2050 to
		1700	10.9	14.6	0.74	2250
	833	2210	13.8	15.3	0.90	
		3175	7.6	10.3	0.74	
C		3210	5.8	8.8	0.66	2050 to
		3540	5.0	8.2	0.60	2250
	912	1800	12.8	15.9	0.80	
		2395	7.5	11.8	0.64	
D		2365	6.3	11.7	0.58	2050 to
		2540	5.3	10.0	0.52	2250
	360	941	17.2	19.9	0.87	
		1065	10.5	14.5	0.75	
E		1200	11.6	15.4	0.76	2050 to
		I.S.	I.S.	I.S.	I.S.	2150
	388	1350	17.5	19.4	0.90	
		1810	10.5	13.6	0.77	
F		2190	9.1	12.1	0.75	2050 to
		2210	8.0	11.4	0.71	2250

* American Society for Testing Materials
I.S. indicates insufficient sample

Dry and fired strength values are in pounds per square inch. Samples were also analyzed chemically, according to specifications given in Test No. C-18-60 (Chemical Analysis of Refractory Materials) of the American Society for Testing Materials. The results of these analyses are tabulated below:

Chemical Analyses - Area I - Liberty County

Sample Number	A	B	C	D	E	F
Water Loss @ 105° C	2.79%	3.22%	3.86%	4.95%	2.50%	5.49%
	% Dry Basis	% Dry Basis	% Dry Basis	% Dry Basis	% Dry Basis	% Dry Basis
Loss on Ignition	10.15	8.85	9.70	11.41	8.36	12.75
Silica (SiO_2)	63.50	68.58	66.22	58.50	71.47	54.16
Alumina (Al_2O_3)	23.13	19.25	20.53	26.13	17.43	28.76
Iron Oxide (Fe_2O_3)	1.72	1.15	1.43	0.81	0.96	2.49
Titania (TiO_2)	0.90	1.10	1.00	1.15	1.25	1.25
Calcium Oxide(CaO)	0.40	0.40	0.40	0.40	0.30	0.40
Magnesia (MgO)	0.00	0.00	0.00	0.30	0.00	0.05
Sodium Oxide(Na_2O)	0.00	0.10	0.23	0.13	0.13	0.11
Potassium Oxide(K_2O)	0.45	0.29	0.37	0.93	0.21	0.25
Lithium Oxide(Li_2O)	0.00	0.00	0.00	0.00	0.00	0.00

The above analyses show a strong similarity in overall chemical composition, indicating that, on the basis of the samples taken, the deposit has no significant variation in chemical composition which would in any way affect the quality of the finished products. Iron oxide (Fe_2O_3) and titania (TiO_2) are present in small quantities and act as pigments, largely controlling the color of the fired product. Neither iron oxide nor titania should constitute more than a few per cent of the

composition of the clay because of their deleterious effects on physical properties when present in greater quantities. The oxides of calcium (CaO), magnesium (MgO), sodium (Na_2O), potassium (K_2O), and lithium (Li_2O) are unnecessary constituents in a structural products clay and become undesirable if more than a few per cent total are present in the sample. All samples in Area I show favorable chemical analyses.

The test results for plasticity, dry shrinkage and dry strength indicate that the properties of the unfired clay are favorable for use in the manufacture of brick or drain tile.

The tests of the materials at various temperatures indicate that optimum qualities are developed at a temperature range of 2050° to 2250°F (Sample #E was not fired at 2250°F because of an insufficient amount of material for further testing). These temperatures are within the ranges commonly used for commercial brick and tile production.

It will be noted that several desirable qualities, including fired strength, absorption, and C/B ratio, improve as firing temperature is raised. However, shrinkage, which must be held within tolerable limits, also increases with temperature, and it is probable that at temperatures greater than 2250°F total shrinkage would exceed tolerable limits. Graphs showing the properties developed at various temperatures are included in Appendix III.

Perhaps the most important quality of a brick clay is one which is extremely difficult to evaluate quantitatively - the color of the fired brick. Sample bricks made for the performance of laboratory tests show an attractive range of colors from light salmon and buff to a deep brick red. The lightest colors are produced at the lowest temperature, and where great strength is not required it is possible that a very attractive light colored brick could be made from this clay. Somewhat darker colors appear among samples fired at the highest temperatures, and samples representing the entire thickness of clay at each location range from a relatively light salmon or buff to somewhat darker shades of red. The colors are uniform and the fired texture, uniform size, and freedom from cracking and warping suggest the possibility of producing a high quality brick and drain tile from this clay.

Remarks - Preliminary work indicates the presence of a deposit of commercial size and quality. Field sampling also suggests a uniformity of quality within the deposit. The deposit is sufficiently close to possible water transportation and is reasonable accessible to truck transportation to offer possibilities for commercial use. Natural gas main lines are located approximately nine miles from the deposit, but transportation of raw materials some distance to a plant site favorably located with respect to natural gas, water transportation and truck transportation may prove feasible.

Area II - Liberty County

Location - Area II is located in Sections 10, 11, 14 and 15, T. 2 South, R. 8 West, near the area known as Estiffanulga, approximately eight to nine miles south of Bristol (Figure 8).

Description of Area - The area is primarily in use as pasture, and part of the area is located in the Apalachicola National Forest. A fish camp and a few buildings occupy a small part of the area, but for the most part the area, including that part within the national forest, is available for the development of industry. The terrain is generally flat, and elevations in the area are sufficient to provide protection from flooding.

Previous Work - Four cores were taken in this area during the course of the drilling program conducted by local interests. The approximate locations of these holes are shown on Figure 8. Holes numbered IV through VII contained thicknesses of clay ranging from eight to seventeen feet. Overburden ranged in thickness from six to eighteen inches.

Sampling Procedure - Four localities were sampled in this area to provide material for testing and to furnish additional information on the extent of the deposit. Two holes were drilled, at localities 4 and 5, and two outcrops were sampled at localities 6 and 7. From these four localities a total of five samples were prepared for testing, as shown below:

Sample Designation	Sample Location	Sample Depth	
G	Hole No. 4	2-12'	Total depth - 12'
H	Hole No. 4	4-12'	
J	Hole No. 5	2-6'	Total depth - 6'
K	Outcrop No. 6	2-12'	Total thickness of exposure
L	Outcrop No. 7	1-6'	Total thickness of exposure

The sampling program in this area, combined with earlier data, strongly suggests a deposit of considerable extent. The sampled intervals were believed to be representative of the deposit as a whole, which, in general, appeared to be quite uniform in quality throughout its extent. Hole number 4 was the only

sample locality which, on the basis of visual examination, seemed to show a possible difference in physical characteristics. However, the results of all testing showed no signigicant differences between a sample representing the total thickness of clay and a sample representing only the lower eight feet of clay.

Quality - As in Area I, the results of visual examination of the samples showed only minor differences in physical properties - primarily color and sand and silt content. The clay is yellow or a red and gray mottled color, fairly plastic and with negligible sand content. Quality appeared to be consistent, both vertically and horizontally. Further indications of the quality of the material are given in the discussion of test results.

Reserves - The area covers an estimated 307 acres. Overburden was found to be less than eighteen inches in all areas sampled, and thicknesses ranged from eight to seventeen feet. A conservative estimate of reserves based on preliminary data indicate the presence of 5.9 million cubic yards, or 8 to 12 million tons.

Results of Testing Program - Five samples were tested from Area II. The locations of these samples are shown on Figure 8 (Locations 4, 5, 6 and 7). Samples G, J, K and L, represent the entire thickness of clay recovered at locations 4, 5, 6 and 7, respectively. Sample H represents all but the upper 2 feet of clay at location 4, and was taken as a check on the vertical uniformity of the deposit. Clays from each sample were fired and tested up to four times, at temperatures ranging from 1950°F to 2250°F. A tabulated summary of the physical test data is given below:

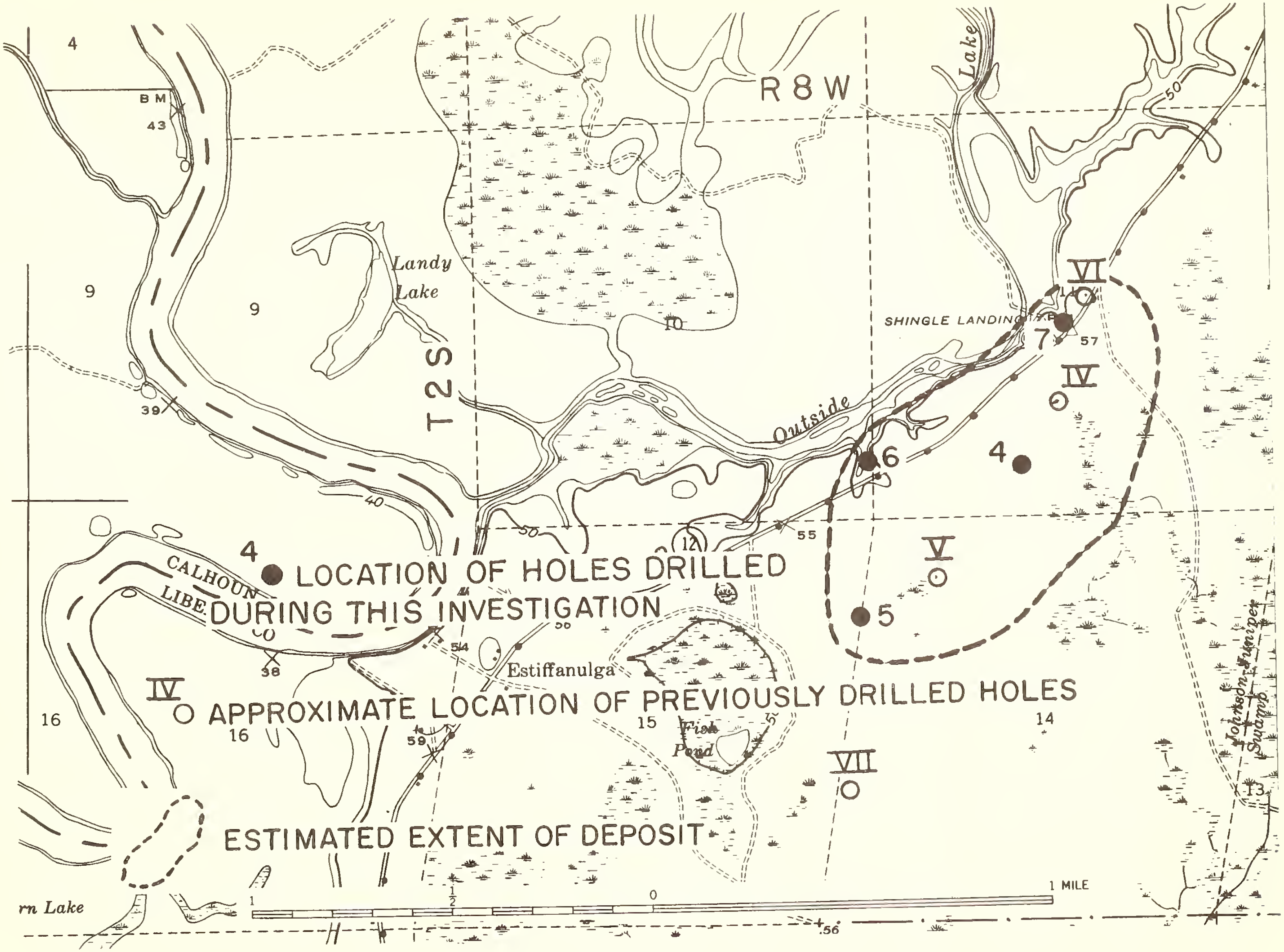


Figure 8 Location of Area II, Liberty County.

Summary of Physical Tests - Area II - Liberty County

Sample No.	Firing Temp. (°F)	Plasticity PSI	% Dry Shrinkage	% Fired Shrinkage	% Total Shrinkage
	1950	52.6	6.1	1.0	7.1
	2050			2.8	8.9
G	2150			3.4	9.5
	2250	I.S.*		I.S.*	I.S.*
	1950	43.1	6.3	0.7	7.0
	2050			2.2	8.5
H	2150			3.2	9.5
	2250			I.S.*	I.S.*
	1950	48.9	6.6	2.3	8.9
	2050			5.5	12.1
J	2150			5.8	12.4
	2250			6.2	12.8
	1950	49.2	6.9	2.3	9.2
	2050			4.1	11.0
K	2150			4.8	11.7
	2250			4.8	11.7
	1950	51.8	6.5	2.4	8.9
	2050			4.4	10.9
L	2150			5.1	11.6
	2250			5.3	11.8

* Insufficient Sample

Summary of Physical Tests (Continued)

Sample No.	Dry Strength (Modulus of Rupture)	Fired Strength (M.R.)	ASTM* Absorption 24 hr.	Total	C/B Ratio	Firing Range (°F)
	469	1062	15.8	18.3	0.87	
		1220	12.6	16.9	0.75	
G		1480	10.7	15.2	0.70	2050 to
		I.S.	I.S.	I.S.	I.S.	2150
	502	1023	15.5	18.2	0.85	
		1095	12.5	16.9	0.74	
H		1375	9.9	14.6	0.67	2050 to
		I.S.	I.S.	I.S.	I.S.	2150
	314	998	18.2	20.9	0.87	
		1399	11.5	15.4	0.75	
J		1398	9.9	13.9	0.71	2050 to
		1430	9.2	13.0	0.70	2250
	952	2430	12.6	15.8	0.80	
		3130	8.5	12.1	0.71	
K		3150	6.7	10.8	0.62	1950 to
		3180	5.9	9.7	0.60	2250
	859	2440	13.0	15.5	0.84	
		3230	11.0	11.5	0.96	
L		3300	6.0	9.7	0.62	1950 to
		3650	5.4	9.5	0.57	2250

* American Society for Testing Materials
I.S. indicates insufficient sample

Samples were analyzed chemically, according to specifications given in ASTM Test No. 6-18-60, Chemical Analysis of Refractory Materials. These results are tabulated below:

Chemical Analyses - Area II - Liberty County

Sample Number	G	H	J	K	L
Water Loss @ 105°C	5.39%	6.35%	2.12%	6.35%	4.20%
	% Dry Basis	% Dry Basis	% Dry Basis	% Dry Basis	% Dry Basis
Loss on Ignition	11.67	10.66	8.69	12.25	10.99
Silica (SiO_2)	65.76	66.46	64.20	59.93	58.89
Alumina (Al_2O_3)	19.24	19.69	22.70	22.65	23.88
Iron Oxide (Fe_2O_3)	1.24	1.72	2.20	2.49	2.96
Titania (TiO_2)	1.40	1.05	1.10	1.35	1.15
Calcium Oxide (CaO)	0.30	0.30	0.40	0.40	0.30
Magnesia (MgO)	0.20	0.40	0.05	0.05	0.40
Sodium Oxide (Na_2O)	0.18	0.08	0.66	0.37	0.37
Potassium Oxide (K_2O)	0.35	0.45	0.31	0.82	1.15
Lithium Oxide (Li_2O)	0.00	0.00	0.00	0.00	0.00

Chemical analyses indicate, as in Area I, a strong similarity in composition, suggesting no significant variations throughout the area sampled. All minor constituents of the clays are present only in tolerable percentages, and the analyses, therefore, show no unfavorable chemical characteristics.

Physical characteristics of the raw materials, dry shrinkage, plasticity and dry strength, indicate uniform material of favorable characteristics for manufacture of brick and tile.

The results of firing tests at various temperatures also indicate that favorable values of total shrinkage, fired strength, absorption and C/B ratio can be developed at commercial firing temperatures, ranging from 1950° or 2050° to 2150° or 2250°F.

In each case a firing range of at least 200° will result in the development of favorable qualities. Graphs showing physical characteristics developed at various temperatures are included in Appendix 3.

The overall variation in physical properties within the area is somewhat greater than in Area I, but this is not sufficient to be of concern in manufacturing.

As in Area I, the improving qualities of strength, absorption and C/B ratio at higher temperatures must be weighed against the increase in total shrinkage as firing temperatures are raised. However, the results of the tests indicate that desirable values for all physical properties may be obtained within the range of commercial firing temperatures, and that, for most uses, a maximum temperature of 2150° to 2250°F is sufficient.

Color of the sample bricks indicates that an attractive range of color - from buff or light salmon to deep red or chocolate brown - is possible. Unlike Area I, further testing may indicate that certain parts of the deposit, while similar in all other respects, may produce slightly different fired colors. Again, there is a definite relationship between temperature and color, with the darker colors appearing at the higher firing temperatures. Colors are uniform at each firing temperature, and the variety of color obatined through the blending of clay during mining and by regulating temperature may prove to be wider than in Area I. Uniform size and texture, and freedom from cracking or warping of the fired clay, indicate the possibility for manufacture of products of high quality.

Remarks - Preliminary work indicates the presence of a clay deposit of commercial size and quality. The full extent of the deposit is not yet known, and additional data are needed to confirm its continuity and uniformity of quality. Water and highway transportation are available in close proximity to the deposit. If necessary, because of anticipated low mining costs, the materials could possible be transported short distances to a plant site favorably located with respect to water and truck transportation and natural gas.

Area III - Liberty County

Location - Area III is located in Section 16, Township 3 South, Range 8 West, approximately 18 miles south of Bristol, Florida (Figure 9).

Description of Area - The topography of the area is generally flat, and elevations in the area are sufficiently high to preclude any danger of flooding. The land has been used for timber production, and is currently planted in pine trees.

Previous Work - Three holes were drilled in this area by local interests in 1960. The approximate locations of these holes

are shown on Figure 9. This drilling program suggested the presence of a clay deposit of possible commercial extent. Holes numbered VIII through X encountered 14 to 16 feet of clay.

Sampling Procedure - In this area a single locality (No. 8) was sampled by drilling to a depth of eight feet, the maximum possible penetration with available equipment. Additional sampling or testing was not considered necessary because transportation and other factors were not so favorable to development as in other areas discussed in this report.

Quality - Any discussion of quality of clay in this area can have only minor significance because of the single sample available for study. However, the clay appeared to be very similar to that obtained from Areas I and II, and was of consistent color - light yellow - in the depth interval sampled. The clay was plastic and free from sand and other impurities.

Reserves - Based primarily on work done by the local group in 1960, clay ranging in thickness from 14 to 16 feet is present over an area of approximately 230 acres. A preliminary estimate indicates the presence of 4.4 million cubic yards, or approximately 6 to 9 million tons.

Results of Testing Program - One sample from Area III was submitted for testing. Sample M represents the entire thickness of clay penetrated at locality No. 8. The results of the tests are given below:

Summary of Physical Tests - Area III - Liberty County

Sample No.	Firing Temp.(°F)	Plasticity PSI	% Dry Shrinkage	% Fired Shrinkage	% Total Shrinkage
	1950	29.2	7.0	2.0	9.0
	2050			4.4	11.4
M	2150			4.5	11.5
	2250			4.9	11.9

Sample No.	Dry Strength (Modulus of Rupture)	Fired Strength (M.R.)	ASTM Absorption 24 hr.	Total	C/B Ratio	Firing Range (°F)
	249	929	19.3	21.4	0.90	
		1440	12.8	15.9	0.81	
M		1450	11.6	15.1	0.77	2050 to
		1465	10.9	14.7	0.74	2250

The sample was analyzed chemically, according to ASTM specifications for analyses of refractory materials. The results of the

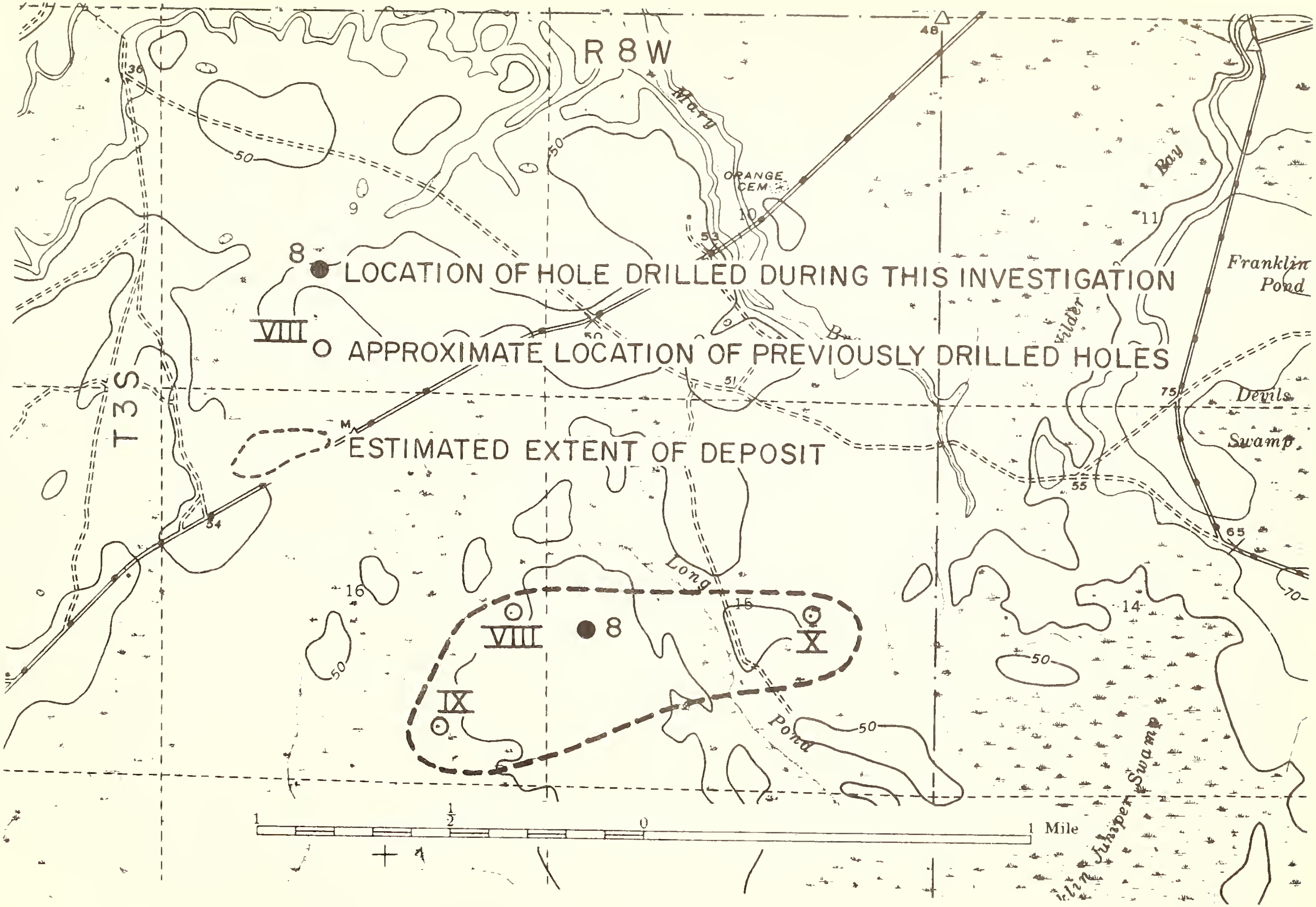


Figure 9 Location of Area III, Liberty County.

analysis are given below:

SAMPLE NUMBER	M
LOSS @ 105°C	% AS REC'D
	2.24
	% DRY BASIS
Loss on Ignition	9.50
Silica (SiO_2)	59.98
Alumina (AL_2O_3)	25.09
Iron Oxide (Fe_2O_3)	2.58
Titania (TiO_2)	1.35
Calcium Oxide (CaO)	0.40
Magnesia (MgO)	0.30
Sodium Oxide (Na_2O)	0.37
Potassium Oxide (K_2O)	0.65
Lithium Oxide (Li_2O)	0.00

Chemical analysis of the sample indicates a favorable composition for the manufacture of structural products. All minor constituents are present only in tolerable percentages.

The physical tests of the raw material suggest that plasticity, dry shrinkage and strength are all sufficient to permit ease of handling and quality control in the manufacturing process.

Tests of the fired clay indicate the development of desirable qualities of strength, absorption, C/B ratio and total shrinkage within the commercial firing temperature range of 2050° to 2250°F.

Color ranges from light salmon through rather dark brick red, depending upon firing temperatures, with the darker colors appearing at higher temperatures. The fired samples are uniform in size, with a smooth, even surface texture, and are free from cracking or warping.

Remarks - The area, though probably containing reserves far in excess of the needs of a single plant, is located over three miles from possible water transportation, one mile from a paved highway, and approximately twenty miles from a natural gas main line. However, it is considered important to sample the deposit,

in the face of these possible drawbacks, to provide additional information on the characteristics of clays in the entire two-county area. Similarity of all deposits sampled has provided a key to further prospecting which may prove useful in this and other areas. The relationship of soil and vegetation classification to the possible presence of commercial clay deposits is discussed in a later section of this report.

Area IV - Calhoun County

Location - Area IV is located east of Blountstown, Florida, in Sections 26, 27, 34 and 35, Township 1 North, Range 8 West (Figure 10). This area was extensively sampled and tested in a previous investigation (Buie, 1957), and the results of that investigation are summarized here.

Description of Area - The area is located along the floodplain of the Apalachicola River and is relatively flat and low-lying, with a maximum elevation of less than fifty feet above sea level.

Previous Work - The work conducted by Buie in 1957, included drilling thirty test holes to determine the extent of the clay deposit, laboratory tests of samples from nine holes, and the manufacture, in a commercial plant, of sample bricks from clay mined near two of the holes. A total of seventeen additional holes were drilled in nearby areas but did not prove the existence of other commercial deposits.

Sampling Procedure - The thirty samples collected by Buie in the area outlined in Figure 10 were taken with a hand auger, and in many places did not penetrate the entire clay section. Holes were generally not drilled to depths exceeding fifteen feet.

Quality - The nine samples which were tested in the laboratory during the course of Buie's investigation showed somewhat more variation, particularly in sand content, than the samples collected in Liberty County during this study. However, Buie's samples were more closely spaced than the Liberty County samples, and it would not be surprising to find, upon closer drilling and more extensive testing, that the deposits were similar in this respect. The samples collected by Buie were also divided into various depth intervals for testing, and up to four tests, representing different depth intervals, were performed from the material taken from each hole.

Results of Tests - The overall results of the tests - which included a visual examination and estimate of value, and tests for hardness, absorption and sand content - indicate a deposit of clay suitable for the manufacture of bricks. The tests were confirmed by the manufacture of test bricks from a five ton sample in a commercial brick plant; Quantitative data on strength and other characteristics of the fired bricks, however, were not obtained.

Reserves - The deposit is estimated to be at least 247 acres in extent. The depth of clay encountered in the holes averaged

approximately ten feet, with less than one foot of overburden. With this information a preliminary estimate of reserves of 3.5 million cubic yards, or 5 to 7 million tons can be made. In his report, Buie emphasized the need for additional close drilling to verify the continuity of the deposit, and also to further determine the total areal extent, which was not defined by his drilling program.

Remarks - The work of Buie strongly suggests that this deposit is of commercial size and quality. His conclusions are supported by laboratory tests and test runs in a commercial brick plant. Area IV is somewhat more favorably located with respect to major highways and natural gas than the Liberty County deposits, but has the disadvantage of lying at a low elevation, subject to annual flooding. Thus, in addition to curtailing mining operations for part of the year, it would be necessary to locate a plant and stockpile in some other area which would have access to natural gas, truck transportation and barge facilities - unless a system of dikes could be economically constructed to provide flood protection.

Other Areas

Prospecting for Additional Deposits - There is reason to believe that additional reserves of clay are present in the two-county area, although none are known or suspected which would be more favorably located with respect to the fuel and transportation needs of a clay products plant than those discussed in this report. The deposits described above, because of the presence of impermeable clay at shallow depths, will not support a dense tree growth. The soil types developed in these areas are also characteristic. Maps of soil and vegetation types in this area show the known clay deposits mapped as "non-commercial savannah", indicating a grassland vegetation and a poorly drained soil underlain by clay, which, in addition to causing poor drainage, inhibits tree growth. Soil and vegetation maps of the Apalachicola National Forest indicate the presence of approximately 3000 areas of non-commercial savannah in that area alone. Additional prospecting through the use of these maps and soil maps of the remainder of the counties could provide a valuable aid in future prospecting efforts if the need for additional reserves should arise.

FEASIBILITY OF RAW MATERIALS PRODUCTION

Determination of Feasibility of Raw Materials Production

Feasibility of raw materials production will be determined by the ability to mine clays in sufficient qualities and of sufficiently high quality at a cost low enough to be competitive in the clay products industry. It has been established in a previous section of this report that a market

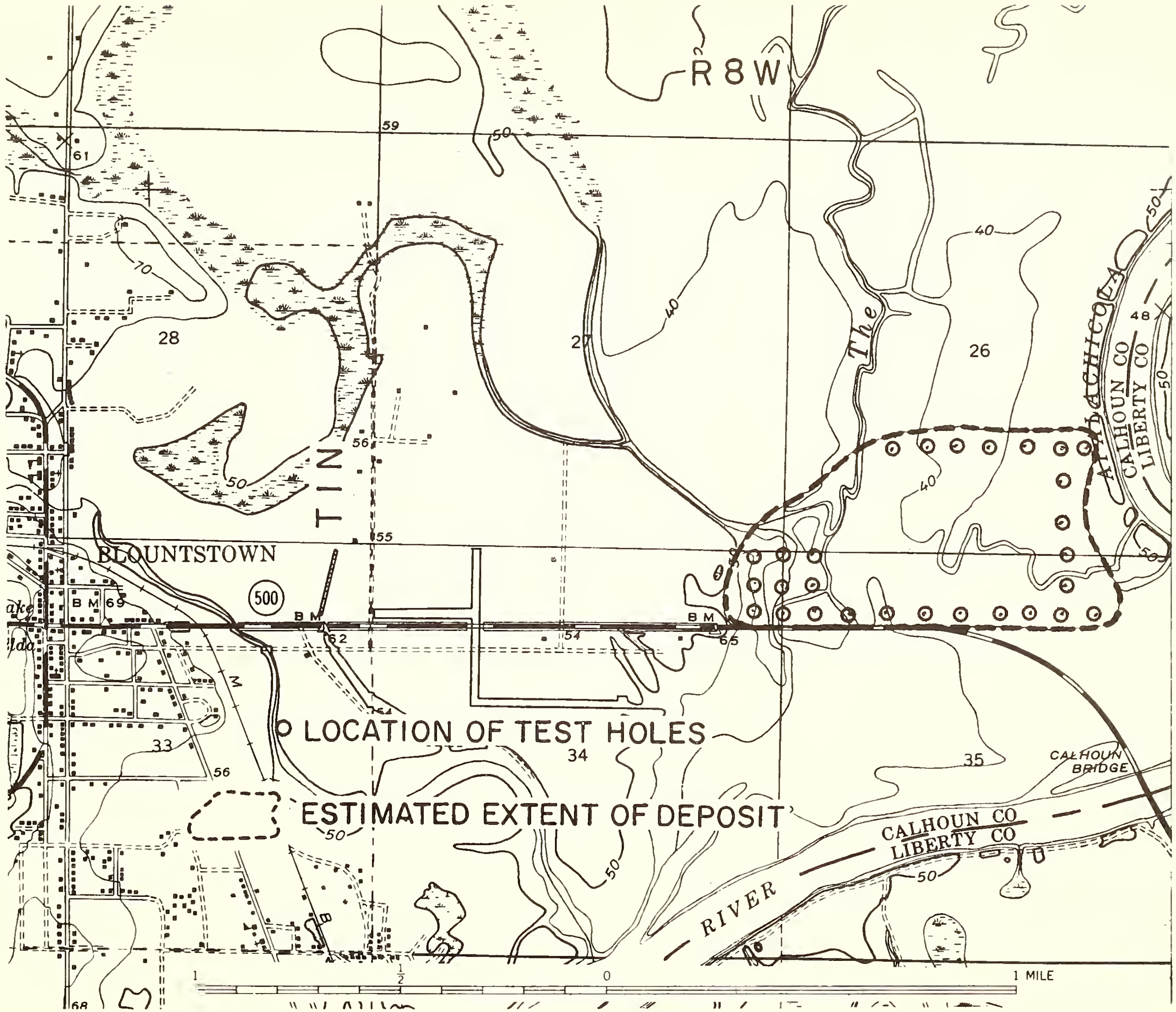


Figure 10   Location of Area IV, Calhoun County.

exists for a clay that can be manufactured into bricks or other structural clay products. This important factor in determining overall feasibility of a clay products industry need not further discussed here. In order to determine economic feasibility of mining the clay deposits of Liberty and Calhoun Counties. the following factors must be considered:

1. Reserves: Clay should be present in sufficient quantity to last throughout the economic life of the manufacturing plant. A forty to fifty year supply is generally considered necessary.

2. Quality: The quality of clay should be high enough to permit the manufacture of a product capable of competing sucessfully for a share of the available market. Quality should be reasonably uniform to permit low-cost quality control and ease of manufacturing.

3. Cost of Mining: Mining cost should be low enough to permit economical manufacturing. It is determined by the cost of land, or royalty payments if land is leased; the mining methods used and cost of removing the clay from the ground; and problems encountered in mining which may result in loss of time or require special equipment or more costly mining methods.

4. Transportation to Plant Site: In almost every mining operation some transportation from the mine or quarry to plant site is necessary, and this represents a share of the cost of the raw material delivered to the plant site. If the plant is located near the mine, a low-cost system such as a conveyor may be used. For greater distances, truck or rail transportation is common. This factor is not only important in determining feasibility of mining but will be important in the selection of a plant site.

In order to present an analysis of the feasibility of raw material production, the data presented earlier on reserves and quality is summarized below for each of the areas studied in the two counties. A discussion of mining and transportation costs will be presented for the area as a while.

Summary of Reserves

Estimates of reserves available for each of the areas previously discussed is given in the table below.

	Area I	Area II	Area III	Area IV
Total Acres	280	307	230	247
Average Thickness of Deposit	9'	12'	12'	9'
Estimated Cubic Yardage of Clay	4,000,000	5,900,000	4,400,000	3,500,000
Estimated Tonage of Clay	6-8 Million	8-12 Million	6-9 Million	5-7 Million
Estimated Supply (Years for Plant of 50 Million brick per year capacity)	60 Years	80 Years	60 Years	50 Years

Although the estimates given above are based on a limited amount of data, there is reason to believe that they may be conservative, and that actual reserves, at least in some areas, are greater than the estimates. A great deal of additional work, however, will be necessary to further refine these estimates, however, there can be little doubt that sufficient reserves, in excess of the quantities needed for a fifty year plant life, could be developed in the area.

Summary of Quality

The quality of the clays and their possible uses have been discussed earlier in this report, and additional, more detailed, data are presented in the appendices. This information may be summarized very briefly:

1. Quality of unfired clay in all deposits tested is entirely adequate for manufacture of bricks, drain tile and possibly other specialty products. No serious drawbacks in the processing or manufacturing are indicated by the laboratory tests.

2. Quality, as indicated by test results, is quite uniform within individual deposits, both laterally and vertically. All deposits appear to be quite similar, and no difficulties in handling or manufacturing due to quality variations are indicated by the test results.

3. Quality of the fired products, in all cases, appears to be more than adequate to meet specifications for most types of brick and drain tile.

In addition, the range of colors; the smooth, even surface texture; and freedom from cracking and warping suggest that a most attractive line of products will be possible.

Mining Methods and Problems; Cost of Mining

Mining methods which would probably be employed in the area covered by this report would consist of relatively simple, low-cost, open-pit methods. Operations would begin with removal of brush and trees, followed by the removal of overburden with a bulldozer or tractor and scraper. In the areas described here, the cost of removing the overburden would be nominal because of the very favorable ratio of overburden thickness to clay thickness.

Clay would then be removed from the deposit with a dragline, in all probability without the necessity of a regular program of drilling and blasting. The only problem which would be anticipated in this type of mining is the accumulation of water in the pits. The pits should be kept relatively dry in order to promote drying and shrinking of clay. The formation of cracks during drying will permit the ready removal of clay from the fact of the pit and should largely eliminate the necessity of blasting. In the Calhoun County deposit, the presence of water may be a deciding factor in determining economic feasibility of mining. Recurrent flooding will necessitate either the building of dikes or a suspension of operations during high water. The latter alternative would require that extensive stockpiles be kept near the plant site, and would result in a higher overall mining cost.

After removal from the pit by dragline, the clay will be placed on trucks or other conveyances and transported either to the plant for processing or to a stockpile for storage before processing.

The very low thicknesses of overburden compared to the average thickness of clay in the area should permit an economicaly mining operation. In addition, there is no reason to believe that land costs will be excessive, or that any problem, other than possible excessive quantities of water in the Calhoun County deposit, will be encountered.

The following table of estimates will summarize the various costs to be incurred in the mining operation:

	Per Cubic Yard
Land cost ($300 to $600 per acre, average minable thickness of clay of 9 feet)	$ .02 to .04
Overburden removal (7 1/2¢ per cubic yard; approximately one yard of overburden to be removed per 5 yards of clay)	.01 to .02

Above table continued -	Per Cubic Yard
Cost of mining, drainage of pits and loading on trucks or conveyors.	$ .15 to .20
Total cost loaded at mine	$ .18 to .24/cubic yard (1.5 to 2 tons per cubic yard)

Transportation

A cost of 5 to 6 cents per ton mile for transportation, by truck, from mine to plant will be added to the mining cost. Thus, with a mining cost of 18 to 24 cents per cubic yard or approximately 9 to 16 cents per ton, a delivered cost at the plant of 62 cents per ton would allow for a transportation distance of up to nine miles.

This cost would permit location of the plant at the natural gas main line and provide for trucking of clay to the plant. In the event that a plant site was located in close proximity to the deposit the delivered cost of clay would be reduced, but an additional capital investment would be required to aid in the construction of the gas line. This alternative is discussed in the section on utility availability and costs. The estimate given here, based on trucking clay to a plant site located at the main line, is for cost estimates purposes only and is not meant to be construed as a recommendation to locate the site at the main gas line.

CONCLUSIONS

1. Clay deposits of probable commercial extent and quality are present in Areas I, II, III and IV as identified herein.
2. Drilling and testing of the deposits, although preliminary and on laboratory scale only, indicates that reserves are adequate to supply a brick and tile plant through the economic life of the plant, and that physical and chemical quantities of the clay should permit the manufacture of building brick and drain tile of excellent quality and attractive appearance.
3. The deposits have essentially comparable locational advantages with respect to availability of natural gas, water, and transportation, except for Area III, Liberty County, which has a distinct locational disadvantage.

4. Mining conditions and anticipated problems are similar in all areas except Area IV, Calhoun County, which may be subject to periodic flooding.
5. Cost of mining should be economical; a delivered cost of less than 62 cents per ton is estimated.
6. At least two of the deposits, Area I and Area II, have no serious disadvantages in quality, reserves, or any other factors which would influence the feasibility of raw material production. Area III, Liberty County, and Area IV, Calhoun County, do not appear to be as favorably located because of transportational and locational disadvantages and the problem of flood control, but contain large reserves of high quality clay.

PART III PLANT DESIGN AND COST ESTIMATES

PLANT CAPACITY AND OPERATING SCHEDULE

The plant layout and design described here has been determined by the characteristics of the raw materials, as indicated by the physical tests described in Part II of this report.

Plant capacity has been determined from the data presented in Part I of this report which indicated the probable share of the market than can be captured by a west Florida plant.

Data presented in Part I also indicate that the small size of the drainage tile market and the declining importance do not justify the additional expense of including tile producing facilities in the plant installation.

A standard stiff-mud type plant using conventional equipment and a continuous tunnel kiln is presented here for the purpose of cost estimation and determination of overall project feasibility. It should be emphasized that additional testing of the raw materials is necessary for final plant design. This testing, preferably on a pilot plant scale, may dictate certain changes in equipment or handling and the prospective manufacturers should avail themselves of the services of qualified ceramic engineers and specialists in the engineering and construction of clay products plants to handle the final plant design.

The product to be manufactured is standard, solid, common red brick, non-color corrected, with a compressive strength of 2000 to 2500 pounds per square inch.

The capacity of the plant is 100,000 bricks per day based on an operating schedule of seven days per week, fifty weeks per year. The annual capacity of the plant is 35,000,000 bricks per year. The continuous tunnel kiln is in operation 24 hours per day, seven days per week for a minimum of 50 weeks per year. All other departments operate on an 8 hour per day, 5 day per week schedule.

Description of Manufacturing Process

The manufacturing process begins with the delivery of the raw materials to the plant site. The clay is delivered by truck in a reasonably clean condition and in lumps not to exceed eight inches. The clay is unloaded into a ground level hopper. Clay is withdrawn from the hopper, through a gate valve, by an apron feeder and deposited on an inclined belt conveyor which delivers it to the granulator, located at ground level.

The raw, granulated clay is taken from the discharge chute of the granulator, by an inclined belt conveyor, to the No. 1, or primary, disintegrator. The disintegrator discharges the crushed and ground clay downward, into a pit, where it is transported, by an inclined belt conveyor, to the smooth rolls for additional mulling and grinding. The smooth rolls also discharge downward into a pit

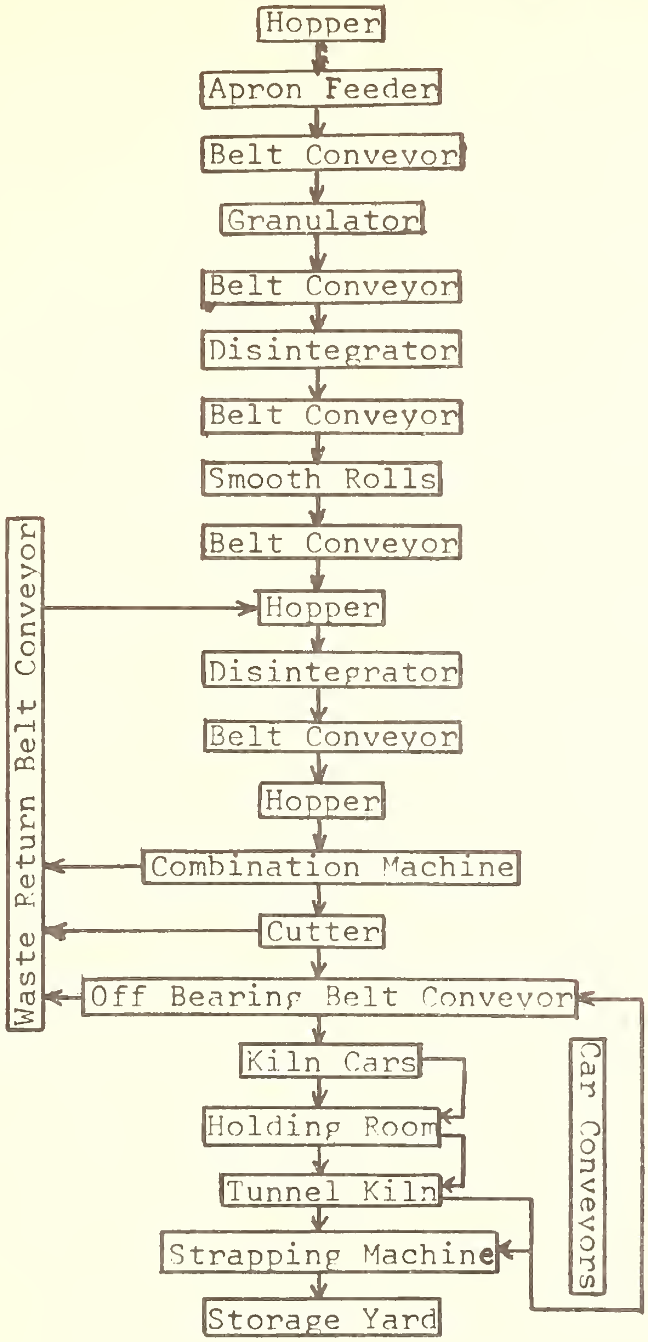


Figure 11, Flow sheet - Brick plant - 35,000,000 bricks per year.

where an inclined belt conveyor lifts the ground and rolled clay to a hopper located above the No. 2, or final, disintegrator. This hopper receives materials from the waste return belt conveyor as well as from the smooth rolls.

Clay from the final disintegrator is also discharged onto an inclined belt conveyor located in a pit and is transported to a surge hopper at the feed end of the combination augering, pugging, de-airing and extruding machine.

The extruded clay, formed to the desired shape is cut to size by the cutter and moved on the off-bearing belt conveyor where men, known as pickers, remove the green ware and stack it on kiln cars. Waste clay from the cutter and improperly formed green ware is returned to the hopper above the final disintegrator by the waste return belt conveyor.

Approximately 2,000 unfired bricks are stacked on each of the kiln cars in such a manner as to permit even circulation of air through the stack while it is being conveyed through the kiln.

The loaded kiln cars are shuttled to the holding room by car-type conveyors and railroad car type tractors. The green ware is stored in the holding room under a controlled temperature of 80 to 90°F and a humidity of 80 to 90 percent. Heat is supplied to the holding room from the dryer end of the tunnel kiln and may be supplemented by direct fired heaters. The humidity is maintained by water spray humidifiers.

The warmed, loaded kiln cars are then shuttled to the tunnel kiln where they are moved continuously through the various heat stages of the kiln to dry, burn and cool. The burned ware emerges from the tunnel kiln as a finished product at a temperature of about 80°F.

The burned ware is then shuttled on the kiln cars to the packaging and strapping machine, where they are strapped in packages of about 500 bricks. The strapped packages are removed for storage by the fork-lift trucks to the storage yard.

Seconds of the finished brick are sorted out on the cull conveyor and are stacked, bundled and hand-strapped in packages of 500 bricks. The culls, chips and burned waste are discharged by the cull conveyor of the strapping machine into a dump truck for disposal.

MANPOWER REQUIREMENTS AND LABOR COSTS

The manpower required for the production of heavy clay products depends on a number of factors, including:

1. The size of the plant.
2. The percent of total capacity at which the plant is operated.
3. The operating schedule.

4. The source of raw materials.
5. The efficiency of labor.
6. The amount of mechanization.
7. The ratio of non-productive empolyeed and fixed costs to production employees.
8. The amount of daily maintenance required.

The relative size of plant obviously affects labor requirements per ton of product because the manpower required to operate machines is not proportional to the output or size of the machines.

The percent of total capcity at which the plant is operated is inversely proportional to the cost per ton of finished product.

The number and length of shifts worked in the various departments obviously affects the number of men employed.

The source of raw materials and the availability of the raw materials affect the crushing operations of the plant.

Efficiency of labor and wage rates react on plant design as well as operation. Where labor is less expensive it may be used for operations in which mechanical equipment would be employed in regions of high labor rates. On the other hand, cheap labor is frequently inefficient labor, so that labor cost per ton of product may be lower in a highly mechanized plant with expensive labor than it would be with cheap labor and less mechanization.

The ratio of non-productive employees and fixed costs to production employees is proportional to the cost per ton of finished product.

The amount of daily maintenance provided is reflected in the amount of down time required for major repairs and overhauls.

The operating schedules of the several departments of a heavy clay products plant determine, for a specific output, the size and cost of the various pieces of machinery and other parts of the plant, and thus affects the capital investment. Operating schedules govern the manpower requirements.

The tunnel kiln, which determines the capacity of the plant, operates 24 hours a day. The kiln is not allowed to cool if continuous operation can possibly be maintained.

The receiving of clay and the grinding, pugging, extruding and manufacturing of green ware is based on an 8 hour per day, 5 days per week schedule.

The packaging and shipping departments are based on an 8 hour per day, 5 days per week schedule. Shipping schedules are determined by the demands of the market, due to either seasonal or economic causes, or both. Thus storage yards and large inventories of finished products must be maintained.

The raw material should be received at this plant, at a rate compatible to the manufacturing schedule. The more uniform and the cleaner this raw material is when received, the lower will be the cost of raw material processing.

The efficiency of the labor market in north Florida at this time is listed in the Bureau of Labor Statistics Reports from Washington, D.C., as excellent, and no change is foreseen in this condition. The wages in north Florida are at present slightly lower than in the larger industrial areas of the north. Some types of equipment require more skill, operators of better technical training, and more technical supervision than others. The percent of highly skilled technicans in a heavy clay products plant is very low.

This plant is highly mechanized, but is not overly complicated with cross connections, blending process equipment or equipment which requires technical operators. Average day workers can easily be trained to operate any equipment in this plant. Interlocking devices on some of the starters will prevent undue misuse of the equipment and overloading.

The ratio of non-productive employees to productive employees as scheduled above is 1 to 8, which is very much in line with average heavy clay products plants.

To maintain an operating schedule of 24 hours per day, 7 days per week, it is customary to employ 4 plant operators. Each of these operators would be required to work an average of 42 hours per week, 40 hours of this time being at straight time and 2 hours per week being at a premium of 1 1/2 to 1, this then amounts to a weekly pay of 43 hours per week per operator, for 50 weeks of the year, with 2 weeks of the year at a straight 40 hours per week during the vacation period, one additional day of 8 hours is added to the weekly schedule to complete the 365 days in one year. It is also customary to pay the employees on the second or afternoon shift a premium of 5 cents on the hour, while the employees on the swing of night shift are paid a premium of 10 cents on the hour.

In accordance with the above schedule the number of persons required to operate the plant would be as follows:

Non-Productive Labor

General Manager: Enjoys the advantage of holding stock in the company and in profit sharing - annual salary $13,000 to $15,000 per year.

Salesmen: 1 required - enjoys the advantage of profit sharing - annual salary $10,000 to $12,000 per year, plus normal operating expenses, (some salesmen elect to work on a smaller guaranteed salary and a commission basis), but for figuringannual expenses for this type of plant the above figures are adequate.

Accountant: Enjoys the advantage of profit sharing - annual salary $8,000 to $10,000 per year.

Laboratory Technician: Annual salary $7,500 to $8,200 per year.

Shipping and Receiving Clerk: Annual salary $4,800 to $5,500 per year.

General Office Help: Annual salary $4,500 to $5,200 per year.

Productive Labor

Plant Foreman: 1 required - starting salary $2.10 per hour with 4-2 1/2¢ increases, making a top salary of $2.80 per hour - number of hours worked, 2,180 per year - $4,528.00 to $5,668.00 per year.

Utility Man: 1 required - starting salary $1.90 per hour with 4-10¢ increases, making a top salary of $2.30 per hour - number of hours worked 2,238 per year - (the utility man is employed as relief man for all phases of operations and as such should be carried at only 40 hours per week but owing to his hourly scale being at a higher rate than some operators, this additional 2 hours premium time is carried to compensate in the operating budget for the higher scale paid during relief time, however, no shift premium is carried for this man, - $4,252.20 to $5,147.40 per year.

Manufacturing Plant Operators: 4 required - starting salary $1.80 per hour with 4-10¢ increases making a top salary of $2.20 per hour - number of hours worked - 2,180 per year - $3,924.00 to $4,796.00 per year per man.

Green Ware Pickers: 11 required - starting salary $1.25 per hour with 4 10¢ increases, making top salary of $1.65 per hour - number of hours worked 2,180 per year - $2,725.00 to $3,587.00 per year, per man. Only 10 pickers actually required, but experience indicates a high percentage of voluntary absence of this class of employee.

Holding Room Men: 5 required - (2 men day shift - 3 men balance of shifts per day and throughout weekend) - starting salary $1.40 per hour with 4-10¢ increases making a top salary of $1.80 per hour - number of hours worked - 2,238 per year - $3,133.20 to $4,128.40 per year per man, plus a shift premium of $449.20 per year.

Kiln Operators: 4 required - starting salary $1.80 per hour with 4-10¢ increases making a top salary of $2.20 per hour - number of hours worked, 2,238 per year - $4,028.40 to $4,923.60 per year, per man, plus a shift premium of $449.20 per year.

Burned Ware Pickers: 11 required - starting salary $1.25 per hour with 4-10¢ increases, making a top salary of $1.65 per hour - number of hours worked 2,180 per year - $2,725.00 to $3,587.00 per year per man. Only 10 pickers actually required, but experience indicates a high percentage of voluntary absence of this class of employee.

Packing Operators: 2 required - starting salary $1.80 per hour with 4-10¢ increases making a top salary of $2.20 per hour - number of hours worked 2,180 per year - $3,924.00 to $4,796.00 per year, per man.

Warehousemen: 4 required - (Fork Lift Operators, Truck Driver and End Load Operator) - starting salary $1.60 per hour with 4-10¢ increases making a top salary of $2.00 per hour - number of hours worked 2,180 per year - $3,488.00 to $4,360.00 per year, per man.

Laborers: 2 required - starting salary $1.25 per hour with 4-10¢ increases, making a top salary of $1.65 per hour - number of hours worked 2,180 per year - $2,725.00 to $3,587.00 per year, per man.

Maintenance Men: 2 required - starting salary $2.00 per hour with 4-10¢ increases making a top salary of $2.40 per hour - number of hours worked 2,704 - (the day maintenance men average a 48 hour work week, with 40 hours per week at straight time and hours per week at premium time of 1 1/2 to 1, this amounts to an average weekly pay of 52 hours per week for 52 weeks a year, however, these day maintenance men do not receive shift premium pay regardless of the time of day during which they work this premium time) - $5,408.00 to $6,489.00 per year, per man.

Assuming a middle of the pay bracket as an average for wages, the annual cost of wages based on 24 hours per day, 7 days per week operation of the tunnel kilns, and 8 hour per day, 5 days per week operation of the manufacturing and shipping portions of the plant, the costs would be:

Non-productive labor	$51,850.00
Productive labor	176,026.00
TOTAL	$227,876.80

INSTALLATION COSTS

The following is a summary of the estimated installation costs of the plant. Details of the estimate are given in Appendix 4.

	LABOR	MATERIALS
Equipment	$199,652.00	$640,097.00
Property and Improvements	3,000.00	5,000.00
Buildings, furniture and fixtures	168,580.00	195,770.00
Utilities	9,495.00	27,585.00
	$380,727.00	$686,452.00
SUBTOTAL		$1,249,179.00

Construction Costs:

Engineering	1 1/2%	$ 5,712.40	$ 13,026.78
Contingency	3%	11,424.81	26,053.78
Overhead			
Labor	15%	57,124.05	
Materials	3%		26,053.78
Profit	6%	22,846.62	52,107.12

SUB TOTAL	$ 214,348.90
Total Installation Costs	$1,463,527.90

SUMMARY OF ANNUAL OPERATING COSTS

The following is a summary of the estimated annual operating costs.

Materials -		$ 109,900.00
Clay 122,500 tons @ 62¢/ton	- $75,950	
Cones 17,500 @ 50¢	- 8,750	
Pallets 70,000 @ 28.8¢	- 20,160	
Strapping 70,000 @ 7.2¢	- 5,040	
Productive Labor (See Manpower Requirements and Labor Costs)		176,026.80
Non-productive Labor (See Manpower Requirements and Labor Costs)		51,850.00
Fuel 158 therms/1000 brick x 3.8¢/therm x 35,000		210,140.00
Power 1.3¢/KWH x (4,349,400+764,6500)HP Hours		49,861.99
Water 6,973,971 gal. @ 20¢/1000 gal.		1,387.59
Supplies (See detailed estimate - Appendix 4)		68,509.78
Telephone @ 40.00/mo.		480.00
Inventory 1,000,000 bricks @ $28.50/1000		28,500.00
Depreciation (See Depreciation schedule - Appendix 4)		57,517.64
Taxes -		23,654.24
Employers liability-1 1/4% of labor	- $2,848.46	
Public liability - 1/2% of labor	- 1,139.38	
Unemployment compensation 54 x 3% x $3000.00	4,860.00	
Social security-54 x 3 5/8 x 4800.00	9,525.60	
Vacation fund - 3% x productive labor	5,280.80	
Fire insurance - 1/2% of plant equipment costs		4,308.86
Legal and Auditing - 1/2% of sales @ 28.50/1000		4,987.50
Sales commissions and advertising - 2% of sales		19,950.00
Travel, bad debts, discounts and allowances-1% of sales		9,975.00
Plant amortization costs per year*		75,210.72
TOTAL ANNUAL OPERATING COSTS		$ 892,260.12

*Estimate for cost estimating purposes only. Based on 25 year loan at 4 3/4% interest. Total amount of loan $1,097,645.93, or 75% of installation costs.

ANALYSIS OF COST AND RETURNS

As shown on the previous page, the annual operating costs of the plant will total an estimated $892.260.12. With an annual production capacity of 35,000,000 bricks, the unit cost of the product is: $25.49 per 1000.

A production cost of $25.49 per 1000 and an FOB sale cost at the plant of $28.50 will permit competitive sales of the brick within the market area. Along the fringes of the market area, transportation costs of $7.00 to $12.00 per thousand will result in a delivered cost of $35.00 to $40.00 per thousand. These costs will meet the prices of existing competitors in the market fringe area; in sections of the market area closer to the plant site, and in the Tampa Bay ar - served by barge transportation, a significant price advantage should be enjoyed, and a greater profit may be possible.

The estimated production cost of $25.49 per 1000 will yield an overall profit of 11.8% at an FOB sales price of $28.50 at the plant. This is, for several reasons, a conservative estimate of profits.

As mentioned above, in areas where the transportation cost advantage over existing competition is great, the profits may be increased somewhat, while, because of lower transportation costs, the delivered costs to the consumers are kept well below those of competing plants.

Other means of increasing profit may be found in alternative financing arrangements, and through favorable negotiations for purchase of equipment and costs of utilities and supplies. Finally, it may be possible to further reduce costs in the final engineering and construction of the plant.

Costs quoted in the preceeding estimates and in the Appendix are generally standard quoted rates for equipment, utilities and labor involved in installation. All of these may be expected to be affected by the final designs and purchase negotiations for the plant and equipment. Further reductions in costs may be realized through favorable arrangements for financing. For the purposes of cost estimating, it was assumed that 75% of plant costs would be financed and the remainder of the plant costs and working capital would be equity capital furnished by the stockholders. Under this arrangement the total stock held would require a cash investment of $491,587.25 and would yield an estimated $77,601.21 at the end of the first year of operation for an estimated return on the stockholders investment of 15.8% after taxes. (See attached balance sheet and operating statement.)

Pro Forma Balance Sheet
At End of One Year of Operation

Assets

Current Assets		
Cash	$ 225,165.98	
Accounts Receivable	83,125.00	
Inventory	25,490.00	
Supplies	5,709.00	
Total Current Assets		$ 354,189.98
Other Assets		
Land	8,000.00	
Plant (Includes Building, Fixtures and Equipment)	1,455,529.90	
	1,463,529.90	
Less Accumulated Depreciation	57,517.64	
Total Other Assets		1,406,012.26
Total Assets		1,745,502.24

Liabilities and Capital

Liabilities		
Accounts Payable	$ 25,968.18	
Federal Income Tax Payable	76,201.21	
Loan Payable	1,074,564.39	
Total Liabilities		1,176,733.78
Capital		
Retained Earnings	77,181.21	
Common Stock	491,587.25	
Total Capital		568,768.46
Total Liabilities and Capital		1,745,502.24

Pro Forma Operating Statement
At End of One Year of Operation

Gross Sales		$997,500.00
Less Discounts and Allowances		9,975.00
Net Sales		$987,525.00
Cost of Goods Sold		
Materials	$114,381.01	
Production Labor	184,312.18	
Fuel	220,031.12	
Power	52,209.05	
Water	1,453.02	
Total Goods Available for sale	$572,386.38	
Less Inventory Ending	25,490.00	
Cost of Goods Sold		546,896.38
Gross Margin on Sales		$440,628.62
Operating Expenses		
Non-productive Labor	$ 51,850.00	
Supplies	68,509.78	
Telephone	480.00	
Other Expenses	34,300.00	
Depreciation	57,517.64	
Taxes	23,654.24	
Fire Insurance	4,308.86	
Legal and Auditing	4,987.50	
Sales Expense	19,950.00	
Interest Expense [1]	52,138.18	
Total Expenses		$286,826.20
Net Income Before Taxes		153,802.42
Corporate Income Tax		$ 76,201.21
Net Income [2]		$ 77,601.21

1. First Year Interest on Loan
2. Principal payment of $23,081.54 to be paid from current income.

NECESSARY CONDITIONS FOR PROFITABLE PLANT OPERATION

The preceeding discussion is based on several assumptions in matters of policy and operating practices which cannot be anticipated in a study such as this. These include the favorable outcome of negotiations for purchase of land and equipment, for power, water and fuel, and an efficient plant management and sales force, as well as the full consideration of marketing and other factors pointed our elsewhere in this report.

The purpose of this study is to determine whether the establishment of a brick plant is feasible or unfeasible. It is believed that all available evidence points to the feasibility of the proposed operation. It should be emphasized that all of these conditions, policies and practices will have a direct bearing on the profit producing potential of this industry. Further exploration and testing of the raw materials deposit and final plant engineering and design may dictate changes or requirements which could result in lowered costs and greater profits.

Therefore, due to the generally conservative estimates used throughout this report, and the considerable latitude available to management in purchase negotiations, engineering and design, and operational and marketing practices, this report should be considered as an indication of the feasibility of the proposed plant, but not as a final determination of the maximum potential for profitable investment and operation.

CONCLUSIONS

1. The establishment of a manufacturing plant capable of producing 35,000,000 bricks per year would appear to be a feasible undertaking in the Bristol-Blountstown area of West Florida.
2. Estimates of installation, operating and unit production costs as well as analysis of costs and returns indicate that such an undertaking should provide an attractive profit incentive to investors.
3. Estimates of costs and projections of returns given in this report are based on assumptions regarding the outcome of negotiations for purchase of equipment and other items, operating procedures and policies, financing of plant, installation costs, final engineering designs and other factors affecting costs of production. Because these factors cannot be fully evaluated, except by those in a position to secure firm commitments through negotiations, the estimated costs and returns given in this report should be taken as a conservative indication of overall project feasibility and not as an ultimate determination of maximum on invested capital.

PART IV. ADDITIONAL FACTORS INFLUENCING FEASIBILITY

AVAILABILITY OF PLANT SITES AND LAND COSTS

In addition to availability of raw materials and the economics of manufacturing and marketing, there are a number of other factors to be considered in evaluating the feasibility of an industrial plant. These include labor conditions, cost of labor, availability of utilities and services, cost and availability of plant sites, and other factors.

Plant site costs and costs of mineral-bearing properties are not discussed in detail because such a discussion would necessarily be based on at least preliminary negotiations for purchase. Since it is not the purpose of this report to actually select and recommend these sites, and since actual costs probably could not be determined accurately unless the negotiators were based on estimates which should be entirely sufficient for the purpose of determining feasibility.

The cost of the plant site itself is included in Appendix 4. The sum of $5,000.00 for the purchase of ten acres is used for the purpose of cost estimation only. Because the undeveloped nature of the property in the general areas suitable for plant locations should result in relatively low land costs, it is unlikely that actual purchase costs will be significantly higher than the figure used in the estimate. Numerous possibilities exist in the area for location of the actual plant site, and it is not to be expected that problems will arise in the selection of a suitable plant site which can be purchased at a reasonable cost. To insure the availability of desirable property for plant sites and for mineral production, the Liberty County Development Committee has secured options on several tracts of land to be made available for industrial development. Criteria for plant site selection will be discussed in greater detail in a later section of this report.

The values of mineral bearing lands are not well established in West Florida, and for this reason the purchase cost of such lands cannot be accurately estimated. A land purchase price for these lands has been estimated at $300.00 to $600.00 per acre; it may prove desirable, however, to lease the clay-bearing lands rather than purchase the properties. In either case, however, when the cost per ton of raw material is determined there should be little, if any, difference in material costs whether the land is leased or purchased. It is not anticipated that availability of mineral producing land for lease or purchase will prove to be a problem.

Characteristics and Availability of Labor

As pointed out earlier in this report, the labor force needed for the operation of the plant under consideration need not be either large or highly skilled. The plant has been designed with a relatively high degree of automation to allow for greater efficiency. All equipment, however, is simple enough to operate so that workers with average qualifications can easily be trained on the job.

The total population of the Redevelopment Area is approximately 90,000. The total labor force of the Area, as given by the 1960 Census of Population totals over 28,000.

Wage rates in the local plant area are as nearly as can be determined generally somewhat lower than the scheduled wages listed in the labor cost estimates.

It is not anticipated that competition for labor will be a problem in the area. With current employment levels such that the area has been designated as a Redevelopment Area, it is to be expected that the plant proposed here should have no difficulty in obtaining a reliable labor force.

Even if labor were in short supply, it would seem that a new industry desiring to locate in the area considered in this report would have no difficulty in attracting personnel. In addition to the incentive provided by steady employment and good wages, the area has much to offer for enjoyable living as well as adequately providing the necessities of life.

The cities and towns in the area, although small, are lively, growing, and attractive communities. Schools and hospitals are adequate, as are water, utilities, and sewage disposal systems. The area is not too far distant from larger centers of population.

Recreational possibilities are almost unlimited with numerous lakes, streams, and the Gulf of Mexico nearby. A moderate climate allows for full enjoyment of outdoor recreational opportunities, which include hunting, fishing, boating, swimming and picnicking.

Local Availability of Gas, Power, Water and Waste Disposal Facilities

In February, 1957, the Federal Power Commission granted approval to the Houston, Texas Gas and Oil Corporation to construct a natural gas pipeline system extending from the east bank of the Mississippi River across the coastal areas of Mississippi and Alabama, through the western part of Florida and then extending south through the western part of Florida and then extending south through the peninsula of Florida to a terminus in Dade County. Natural gas is presently marketed in Florida by the Florida Gas Transmission Company.

The completion of this pipeline system through Redevelopment

Area A has made available a low cost source of fuel to industries wishing to locate in that area.

The present main pipeline and lateral lines provide a basic network from which industry could be supplied at any of the possible sites proposed in this report. The main line traverses Area A in a general east-southeast direction, passing eleven miles south of Chipley, approximately fifteen miles south of Marianna, and just north of Blountstown and Bristol. Lateral lines serve Chipley, Marianna and other principal towns in the area. Additional lines of appropriate capacity have been built to serve industries in the area.

For the purpose of determining the unit cost of product a gas cost of 3.8 cents per therm was used. This is the estimated cost of service at the natural gas main line and location of the plant at this site would require trucking of raw materials approximately nine miles. An alternative arrangement is possible which, while requiring a larger capital investment, would lower the unit cost of product and increase profits by reducing the cost of transportation of clay from the mine to the plant.

The Florida Gas Transmission Company has provided estimates for costs of pipeline construction to two general locations - two miles south of Bristol on the Apalachicola River and six miles south of Bristol on the river. The cost to the buyer - in the form of an aid to construction cost is estimated at $74,000 for the former and $153,000 for the latter site.

Since a cost of transportation of approximately 40 cents per ton would be required if the plant were located near the main line, the above costs present a strong argument for location of the plant site near the deposit, because the initial cost of pipeline installation would be offset by the savings in raw materials cost within a few years.

The area is supplied with electric power by the Gulf Power Company and the Florida Public Utilities Company. Estimates of power costs used in determining the production costs were furnished by the Florida Public Utilities Company of Marianna.

The development of an adequate supply of good quality water for the use in the manufacturing process and for sanitary and drinking purposes is not a problem in Redevelopment Area A. The entire area is underlain by an extensive aquifer containing abundant supplies of very pure water. Water can be supplied either from wells drilled to depths of 100 to 500 feet, or it can be purchased from municipal systems if the plant site is served by such a system. For the purpose of this report it is assumed that water will be produced from a well at a cost of 20¢ per thousand gallons. A comparable cost should be possible if the plant is located within an area of municipal water distribution.

Waste disposal does not present a problem at any of the possible locations mentioned in this report. The industrial waste

produced in this type of plant are neither harmful nor difficult to dispose of. The disposal of sanitary waste material, which in terms of volume, will probably be as great as the industrial wastes, can be handled either by the system provided for in the cost estimate or by a municipal system if the plant site is located near one of the towns in the area.

Summary of Florida Tax Laws

Income Tax - There is no state income tax on either individuals or corporations. The state income tax is forbidden by the Florida Constitution, and only in the event of a Constitutional amendment could a state income tax be levied.
State Ad Valorem Tax - The State of Florida does not impose an ad valorem tax on real properties. Taxes on real property are the domain of cities and counties, and, in general real property is assessed at 20 to 70 percent of recent market value. In Calhoun County, property is assessed at 29.78% of value, with a county-wide tax rate of 55 mills. Liberty County, which is divided into three tax districts assesses property at 60.00% of value and has an average tax rate of 20.00 mills. A recent decision of the Florida Supreme Court has, however, upheld a statute requiring that all property shall be assessed at "just value".
Corporate Organization and Qualification Fees - Corporations organized within the state pay fees based upon the authorized capital stock at the following rates:

Authorized Capital Stock with Par Value

Up to and including $125,000.00, $2.00 for each $1,000.00 of par value stock

Over $125,000.00 but not over $1,000,000.00, $250.00 plus 50¢ per $1,000.00 of par value stock

Over $1,000,000.00 but not over $2,000,000.00, $687.50 plus 25¢ per $1,000.00 of par value stock

Over $2,000,000.00, $937.50 plus 10¢ per $1,000.00 of par value stock over $2,000,000.00

Minimum Fee: $10.00

Filing Permit: $5.00

Corporations also pay fees for increase in authorized capital stock by amendment or consolidation at the same rate as initial fees.

For receiving and filing a certificate of dissolution, amended certificate of incorporation, or decrease of capital, a fee of $10.00 is charged.

Annual Corporation Franchise Tax - All corporations pay an annual franchise tax based on invested capital represented by shares of stock outstanding, as follows:

Outstanding Capital Stock	Tax
Not over $10,000.	$ 20.00
Over $10,000 but not over $25,000	$ 50.00
Over $25,000 but not over $50,000	$ 100.00
Over $50.000 but not over $100,00	$ 150.00
Over $100,000 but not over $200,000	$ 200.00
Over $200,000 but not over $500,000	$ 400.00
Over $500,000 but not over $1 Million	$ 1,000.00
Over $1 Million but not over $2 Million	$ 1,500.00
Over $2 Million	$ 2,000.00

State and County Manufacturer's License - The annual charge for this license is $7.50 plus $1.50 for each employee. The County Judge's issuing fee is 25¢. The maximum charge for this license is $150.00 plus the 25¢ issuing fee.

State Intangible Personal Property Tax - All corporations organized in the State are required to file an annual return to the County Tax Assessor covering money, stocks, bonds, mortgages, notes, contracts for deeds, accounts receivable, and annuities whether such properties are held in the State or elsewhere.

The following schedules apply to intangible personal property:

Class A: Money, bank deposits, certified checks, money placed in savings and loan associations.
tax rate - 10¢ per $1,000.00.

Class B: All stocks and bonds, except U. S. Government and Florida municipal bonds.
tax rate - $1.00 per $1,000.00.

Class C: Obligations secured by mortgages on Florida real estate.
tax rate - $2.00 per $1,000.00.
(Before a mortgage can be recorded this tax must be paid to the tax collector, and this is the only time intangible tax is paid on the obligation.)

Class D: Unsecured accounts and notes receivable, mortgages on property outside Florida, contracts for deeds, annuities, and all other classes of intangible property not included in Classes A, B, or C above.
tax rate - $1.00 per $1,000.00.

Sales Tax - While the State of Florida has a 3 percent sales tax, business and industry is affected by this tax (other than acting as collectors) only to the extent that they are consumers in final purchase. Materials which are component parts or used in processing are exempt from this tax.

There is also a limitation of the tax to $1,000.00 for a "single purchase at a single location, delivered within six months from the date of order, when such machinery or equipment is for use in manufacturing or processing of tangible personal property for sale."

Effects of Tax Structure on Industrial Development - The effects of taxation on the location and operation of industry is a difficult factor to evaluate because of differences in levels of assessment and differences in the qualities of service for which the taxes are paid.

Available information suggests that there is no firm basis for a belief that current differences in the State and local taxes represent an important factor in the location of industry. The reason for this is that State and local taxes represent only a minor part of the operating costs of a business. Rates of taxation are likely to be important only when all other costs are equal.

In Redevelopment Area A the only possible effect that taxation could have on the selection of an industrial site would grow out of differentials in levels of assessment and rates of taxation between the counties in which the industry may locate. These slight differences will almost certainly be outweighed by factors such as availability of raw materials and transportation costs and as the recent Supreme Court ruling, requiring assessment of property at just value, begins to take effect, even these differences are likely to disappear. Because the new law limits the cut in millage and will, because of the homestead exemption law, broaden the tax base, and thus provide additional revenue, it should be unnecessary for counties or cities to place a heavy tax burden on new industry.

In general, it may be siad that State tax laws in Florida are favorable to industry. This is because of the relatively high tax burden placed on the consumer - an outgrowth of the heavy tourist spending in the State, and the relatively low tax burden placed on the producer - a policy which has prevailed because of the desire to encourage industrial development.

There are no special laws or regulations governing the production or sale of clay products or the mining of raw materials for the use in the clay products industry.

CRITERIA FOR SELECTION OF THE PLANT SITE

The foregoing discussion, indicating the feasibility of establishing a brick plant, is based on several assumptions which can be valid only if the chosen plant site meets certain requirements. There are reasons to believe that several possible sites

with equal advantages may be present in the general area, and until this can be determined to some degree of certainty by negotiations for land, utilities and other items. It would be premature to recommend a specific plant site location.

A careful evaluation must be made of all of the factors which will affect the costs of installation, operation, and production.

Several locational factors normally affecting the economics of plant operation would appear to be essentially equal throughout the general area. These are:

1. Proximity to Markets
2. Transportation
3. Labor Cost and Availability
4. Availability of Utilities

Other locational factors will have a more direct effect on the economics of plant operation and should be carefully weighed in reaching a decision on the selection of the plant site. These are:

1. Availability and Cost of Raw Materials. This will be affected primarily by cost of transportation of raw materials from the mine to the plant as other factors may indicate the necessity of locating the plant at some distance from the source of raw materials.
2. Cost of Utilities- The cost of utilities will, to a considerable extent, affect the location of the plant. A location must be chosen which can be furnished with gas, electricity and water at the most economical rates.
3. Tax Structure- Since the proposed industry has a choice of two counties in which to locate, the local tax structure may have some bearing on site selection. In areas where industrial tax rates are not well established due to a previous lack of industry, the taxes assessed on industry may be established, through negotiation, prior to the final selection of the plant location.
4. Site Availability and Cost- The availability of underdeveloped or relatively low cost land in the general areas indicates that high land costs should not be a limiting fact in site selection, because land costs are a relatively small percentage of total installation costs. It is far more important to select a site which will result in continued savings in costs of utilities and raw materials transportation than to seek low-cost acreage for the plant site.
5. Barge Loading and Docking Facilities- The market analysis in part I of this report emphasizes the need for ready access and proximity to adequate barge loading and docking facilities. This factor will have an important bearing on plant location.

6. <u>Community Participation and Attitudes</u>- The attitudes prevalent in the local communities toward the location of the industry may under certain conditions have an important bearing on plant location. In this case it would seem that the willingness of the community to welcome industry and to actively assist in developing an attractive setting for industry will have a direct effect on plant location. Bristol and Blountstown are both actively interested in attracting industry and discussions with community leaders in both towns suggest a willingness to participate in a local program to locate industry. Both towns have plans for port development and for providing industrial sites adjacent to port facilities. The realization of these plans will undoubtedly have some effect on future industrial locations in the area.

FINAL CONCLUSIONS

1. A study of the market potential for a Bristol-Blountstown based brick plant indicates a probable demand of 100,000,000 bricks per year in the market area.
2. A plant located in the Bristol-Blountstown area could reasonably expect to capture thirty to thirty-five percent of the existing brick market, for a total annual sales of thirty to thirty-five million bricks per year.
3. A portion of the market, the Tampa Bay area, would be served by barge transportation.
4. Several areas which are capable of producing raw materials of sufficiently high quality for commercial brick production are present in the Bristol-Blountstown area.
5. Reserves of these materials are present in sufficient quantities to supply a brick industry throughout the economic life of a brick plant.
6. Raw materials can be produced at sufficiently low costs to permit economical manufacturing.
7. The preliminary plant designs and cost estimates indicate that bricks can be produced at a cost of approximately $25.00 per thousand. With an F.O.B. plant site sales cost of $28.00 to $29.00 per thousand. The plant should be in a position to market competitively throughout the market area.
8. Depending upon the actual arrangements made for financing plant installation and other costs, as well as a number of other factors to be determined by the actual investors and builders of the plant, conservative estimates of return on equity capital would indicate a profit range of 15 to 16 percent. Alternative financial arrangements, site locational factors, final engineering of the plant and other factors could increase this estimate significantly.
9. It is concluded that proposed establishment of a brick industry in the Bristol-Blountstown area is feasible. An evaluation of all available data indicates that all necessary conditions for profitable operation can be met and that a sufficient profit incentive exists to justify the establishment of the plant.

APPENDIX I

Logs of Drill Holes and Outcrop Sample Descriptions

Location No. 1 - Drill Hole

Depth (feet)	Description
0-1	Overburden. Sand with minor amounts of clay. Grades into:
1-4	Clay, red and gray mottled, silty, plastic, very dense. Grades into:
4-7	Clay, gray with some red streaks, slightly silty, dense and plastic, with some red and yellow iron oxide staining. Grades into:
7-10	Clay, red and gray mottled, silty, plastic and dense.

Abandoned at total depth of 10' without penetrating entire clay section.

Sample Designation

Sample A - Composite sample 1' - 10'

Sample B - 1' - 4' depth interval

Sample C - 4' - 7' depth interval

Sample D - 7' - 10' depth interval

Location No. 2 - Drill Hole

Depth (feet)	Description
0-1	Overburden, black topsoil.
1-4	Overburden, sand, medium grained, yellow with some clay.
4-7	Clay, gray, slightly silty, plastic and very dense, forced to abandon hole at depth of 7' without penetrating entire clay section.

Sample Designation

Sample E - 4' - 7' depth interval, total sample.

Location No. 3 - Drill Hole

Depth (feet)	Description
0-1	Overburden; silty, sandy clay.
2-6	Clay, red to yellow with some gray, iron stained, plastic, slightly silty and very dense. Forced to abandon at total depth of 6' without penetrating entire clay section.

Sample Designation

Sample F - 2' - 6' depth interval, total sample.

Location No. 4 - Drill Hole

Depth (feet)	Description
0-1	Overburden, topsoil.
1-2	Overburden, hard sandy clay.
2-4	Clay, red and gray mottled, plastic, slightly silty, dense.
4-8	Clay, gray with streaks of yellow, iron stained, very sticky and plastic, with some organic material and very little silt.
8-10	Clay, stiff and dense, plastic, gray in color.
10-12	Clay, as above but red and yellow mottled. Abandoned at 12' without penetrating entire clay section.

Sample Designation

Sample G - Composite sample 2' - 12'.

Sample H - 4' - 12' depth interval.

Location No. 5 - Drill Hole

Depth (feet)	Description
0-2	Overburden, topsoil.
2-6	Clay, red with streaks of yellow, silty, plastic and very dense.
6-10	Clay, as above but with some fine sand, becoming more sandy and micaceous with depth. Abandoned at depth of 10'.

Sample Designation

Sample J - 2' - 6' depth interval.

Location No. 6 - Roadcut

Depth (in feet from top of roadcut)	Description
0-2	Overburden, soil and sand.
2-12	Clay, red, yellow and gray mottled, plastic, dense.
12-14	As above (reported by road contractor that an additional two feet of similar material was removed to install culvert). Covered interval not sampled.

Sample Designation

Sample K - 2' - 12'. Total exposed interval.

Location No. 7 - Roadcut

Depth (in feet from top of roadcut)	Description
0-1	Overburden, sand and soil.
1-3	Clay, red and yellow dense and plastic, oxidized on surface.
3-6	Clay, as above but gray with yellow iron staining.

Sample Designation

Sample L - 1' - 6', total exposed interval.

Location No. 8 - Drill Hole

Depth (feet)	Description
0-1	Overburden, sand ans topsoil.
1-4	Clay, yellow, plastic, slightly silty, dense.
4-6	Clay, as above, but changing in color with increasing depth to gray with some reddish streaks. Abandoned at total depth of 8'.

Sample Designation

Sample M - Composite sample 1' - 8'.

APPENDIX 2 DETAILED TEST RESULTS

SAMPLES A - F

Sample No.	Firing Temp.(°F)	(Minutes) Simpson Mixer Time Wet	Dry	Water Added Cc.	Vari-drive	Vacuum, Lbs.	Extrusion Behavior
	1950	4	0.5	1500	3.75	26.5	A
	2050						
A	2150						
	2250						
	1950	5	0.5	1700	3.75	26.5	A
	2050						
B	2150						
	2250						
	1950	4	0.5	1750	3.75	26.5	A
	2050						
C	2150						
	2250						
	1950	4	0.5	1750	3.75	26.5	A
	2050						
D	2150						
	2250						
	1950	2.5	0.5	1200	3.75	26.5	A
	2050						
E	2150						
	2250						
	1950	3	0.5	1450	3.75	26.5	A
	2050						
F	2150						
	2250						

Samples A - F continued

Sample No.	% Water Plasticity	Plasticity PSI	% Dry Shrinkage	% Fired Shrinkage	% Total Shrinkage
A	18.6	79.7	4.7	2.3	7.0
				4.8	9.5
				5.1	9.8
				5.4	10.1
B	19.8	52.9	4.9	2.9	7.8
				4.3	9.2
				4.7	9.6
				4.9	9.8
C	19.9	62.1	6.0	1.8	7.8
				4.6	10.6
				5.0	11.0
				5.1	11.1
D	20.2	48.8	6.2	2.1	8.3
				4.1	10.3
				4.7	10.9
				5.2	11.4
E	20.4	45.4	5.8	1.3	7.1
				2.6	8.4
				3.9	9.7
				I.S.	I.S.
F	22.4	56.0	6.0	2.6	8.6
				5.4	11.4
				6.1	12.1
				5.5	11.5

Samples A - F continued

Sample No.	Dry Strength	Fired Strength	ASTM Absorption 24 hr.	ASTM Absorption Total	C/B Ratio	Firing Range
	641	1659	14.4	16.7	0.86	
		2290	10.3	13.8	0.75	
A		2110	8.7	12.4	0.74	2050 to
		2310	8.1	12.4	0.66	2250
	396	1062	17.2	19.4	0.89	
		1620	12.6	16.2	0.78	
B		1550	11.6	15.4	0.75	2050 to
		1700	10.9	14.6	0.74	2250
	833	2210	13.8	15.3	0.90	
		3175	7.6	10.3	0.74	
C		3210	5.8	8.8	0.66	2050 to
		3540	5.0	8.2	0.60	2250
	912	1800	12.8	15.9	0.80	
		2395	7.5	11.8	0.64	
D		2365	6.3	11.7	0.58	2050 to
		2540	5.3	10.0	0.52	2250
	360	941	17.2	19.9	0.87	
		1065	10.5	14.5	0.75	
E		1200	11.6	15.4	0.76	2050 to
		I.S.	I.S.	I.S.	I.S.	2150
	388	1350	17.5	19.4	0.90	
		1810	10.5	13.6	0.77	
F		2190	9.1	12.1	0.75	2050 to
		2210	8.0	11.4	0.71	2250

APPENDIX 2 DETAILED TEST RESULTS

SAMPLES G - M

Sample No.	Firing Temp.(°F)	(Minutes) Simpson Mixer Time Wet	Dry	Water Added Cc.	Vari-drive	Vacuum, Lbs.	Extrusion Behavior
	1950	2.5	0.5	1050	3.75	26.5	A
	2050						
G	2150						
	2250						
	1950	2.0	0.5	700	3.75	26.5	A
	2050						
H	2150						
	2250						
	1950	3.5	0.5	2000	3.75	26.5	A
	2050						
J	2150						
	2250						
	1950	4.5	0.5	1900	3.75	26.5	A
	2050						
K	2150						
	2250						
	1950	3.0	0.5	1500	3.75	26.5	A
	2050						
L	2150						
	2250						
	1950	4.0	0.5	2200	3.75	26.5	A
	2050						
M	2150						
	2250						

Samples G - M continued

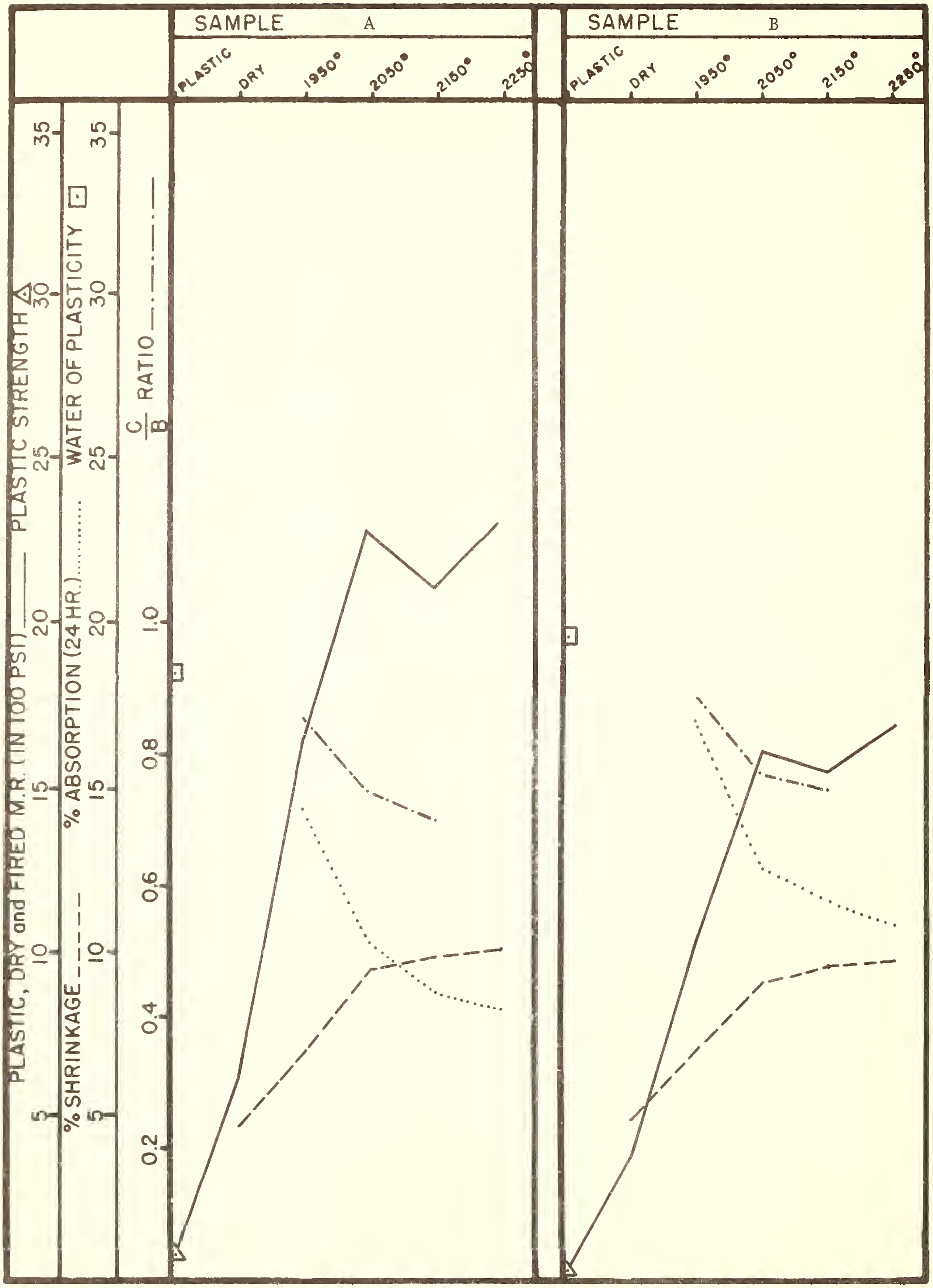
Sample No.	% Water Plasticity	Plasticity PSI	% Dry Shrinkage	% Fired Shrinkage	% Total Shrinkage
	19.7	52.6	6.1	1.0	7.1
				2.8	8.9
G				3.4	9.5
				I.S.	I.S
	19.9	43.1	6.3	0.7	7.0
				2.2	8.5
H				3.2	9.5
				I.S.	I.S.
	23.8	48.9	6.6	2.3	8.9
				5.5	12.1
J				5.6	12.4
				6.2	12.8
	22.2	49.2	6.9	2.3	9.2
				4.1	11.0
K				4.8	11.7
				4.8	11.7
	21.2	51.8	6.5	2.4	8.9
				4.4	10.9
L				5.1	11.6
				5.3	11.8
	24.0	29.2	7.0	2.0	9.0
				4.4	11.4
M				4.5	11.5
				4.9	11.9

Samples G - M continued

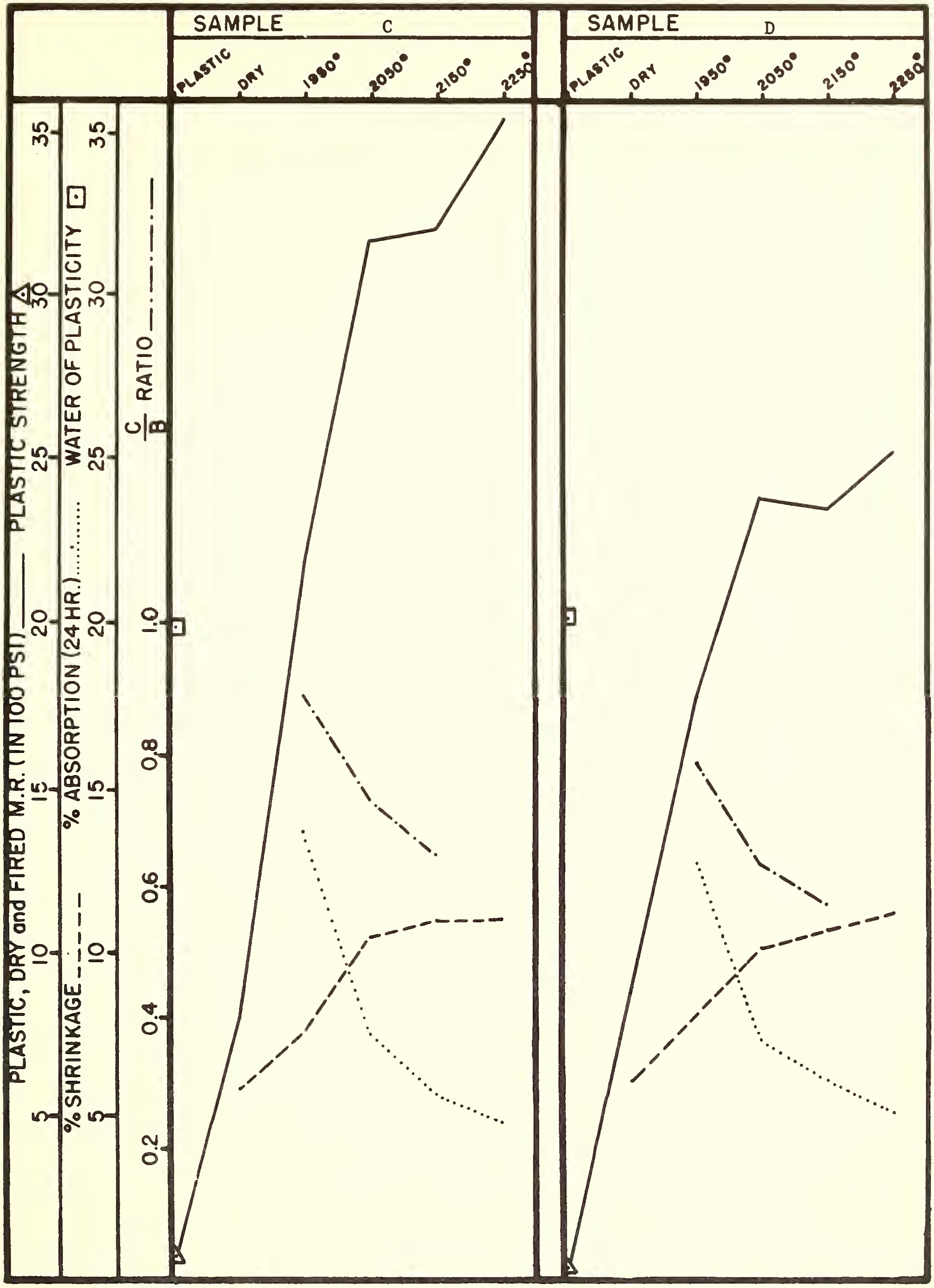
Sample No.	Dry Strength	Fired Strength	ASTM Absorption 24 hr.	ASTM Absorption Total	C/B Ratio	Firing Range
	469	1062	15.8	18.3	0.87	
		1220	12.6	16.9	0.75	
G		1480	10.7	15.2	0.70	2050 to
		I.S.	I.S.	I.S.	I.S.	2150
	503	1023	15.5	18.2	0.85	
		1095	12.5	16.9	0.74	
H		1375	9.9	14.6	0.67	2050 to
		I.S.	I.S.	I.S.	I.S.	2150
	314	998	18.2	20.9	0.87	
		1399	11.5	15.4	0.75	
J		1398	9.9	13.9	0.71	2050 to
		1430	9.2	13.0	0.70	2250
	952	2430	12.6	16.8	0.80	
		3130	8.5	12.1	0.71	
K		3150	6.7	10.8	0.62	1950 to
		3180	5.9	9.7	0.60	2250
	859	2440	13.0	15.5	0.84	
		3230	11.0	11.5	0.96	
L		3300	6.0	9.7	0.62	1950 to
		3650	5.4	9.5	0.57	2250
	249	929	19.3	21.4	0.90	
		1440	12.8	15.9	0.81	
M		1450	11.6	15.1	0.77	2050 to
		1465	10.9	14.7	0.74	2250

APPENDIX 3

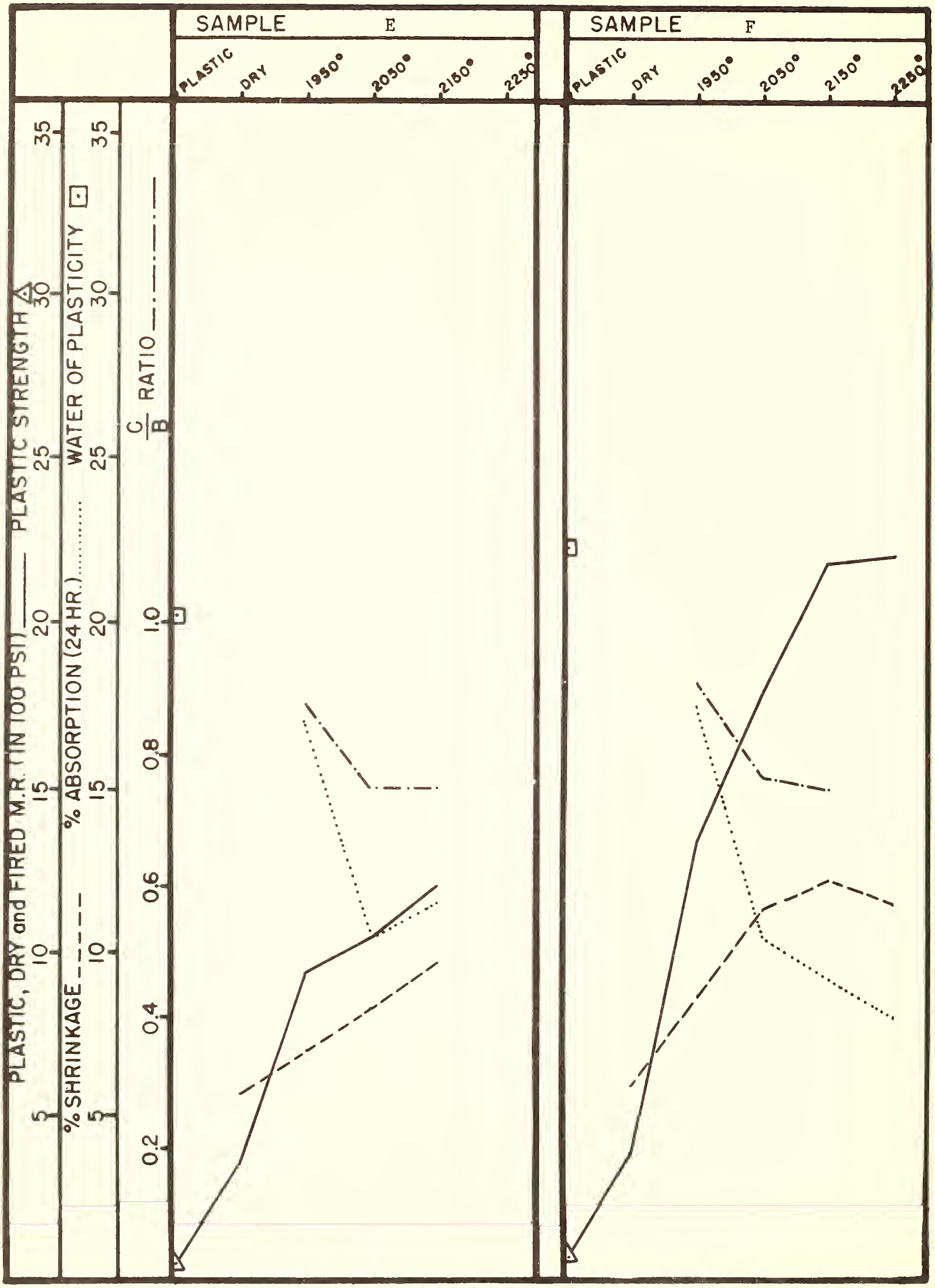
Graphs showing properties of clay at various temperatures.



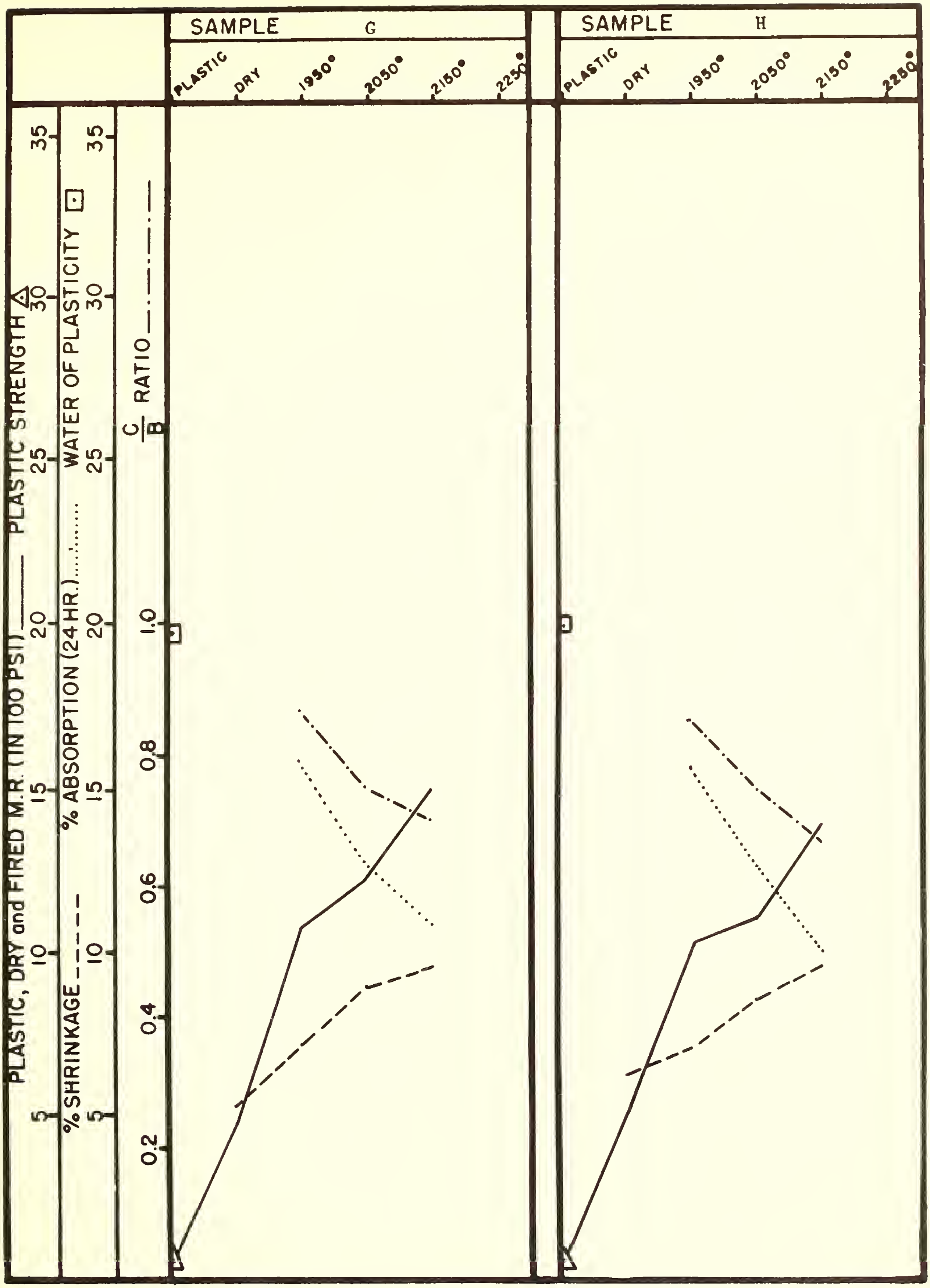
APPENDIX 3, GRAPHS OF CLAY PROPERTIES AT VARIOUS TEMPERATURES



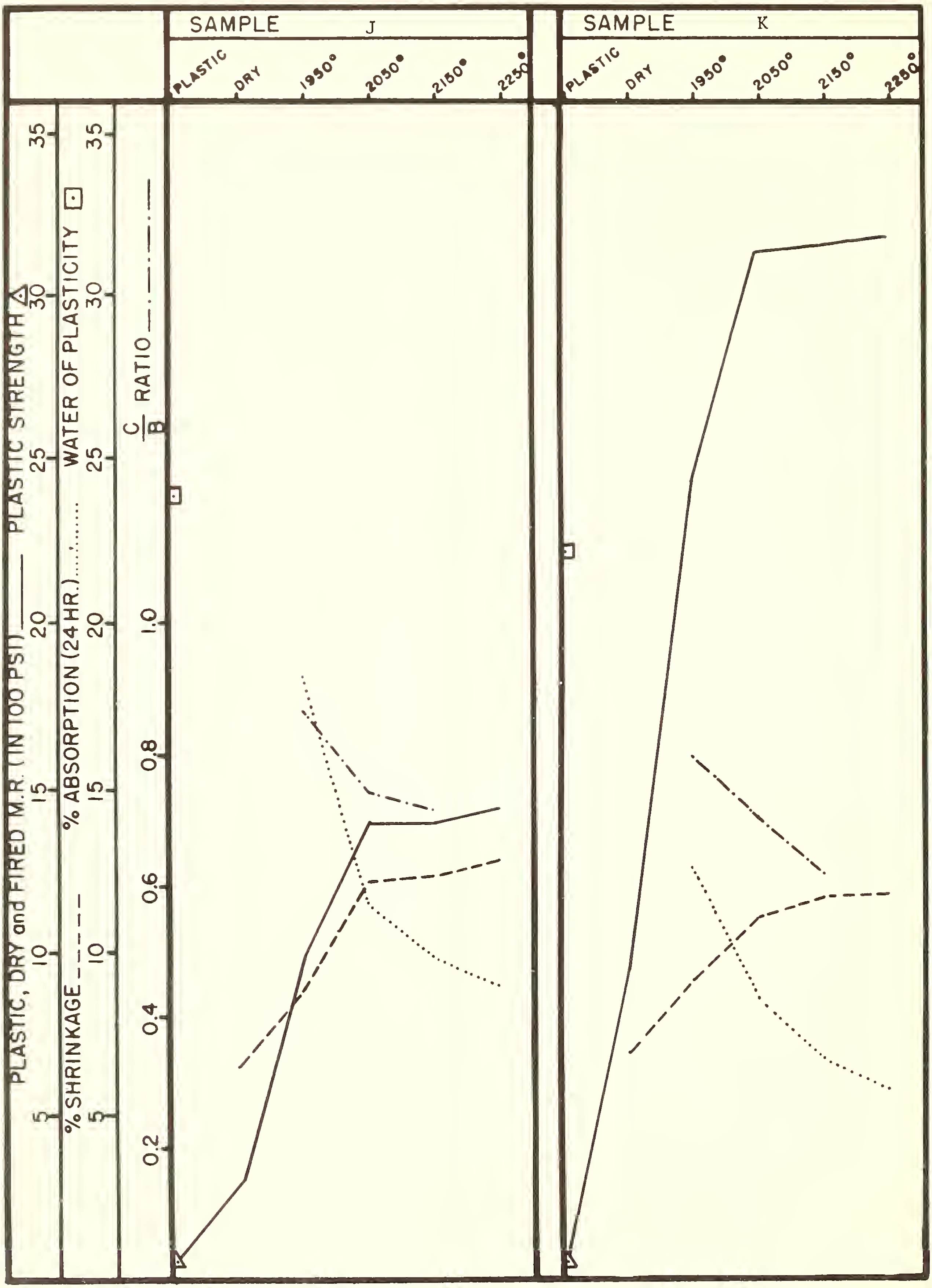
APPENDIX 3, GRAPHS OF CLAY PROPERTIES AT VARIOUS TEMPERATURES



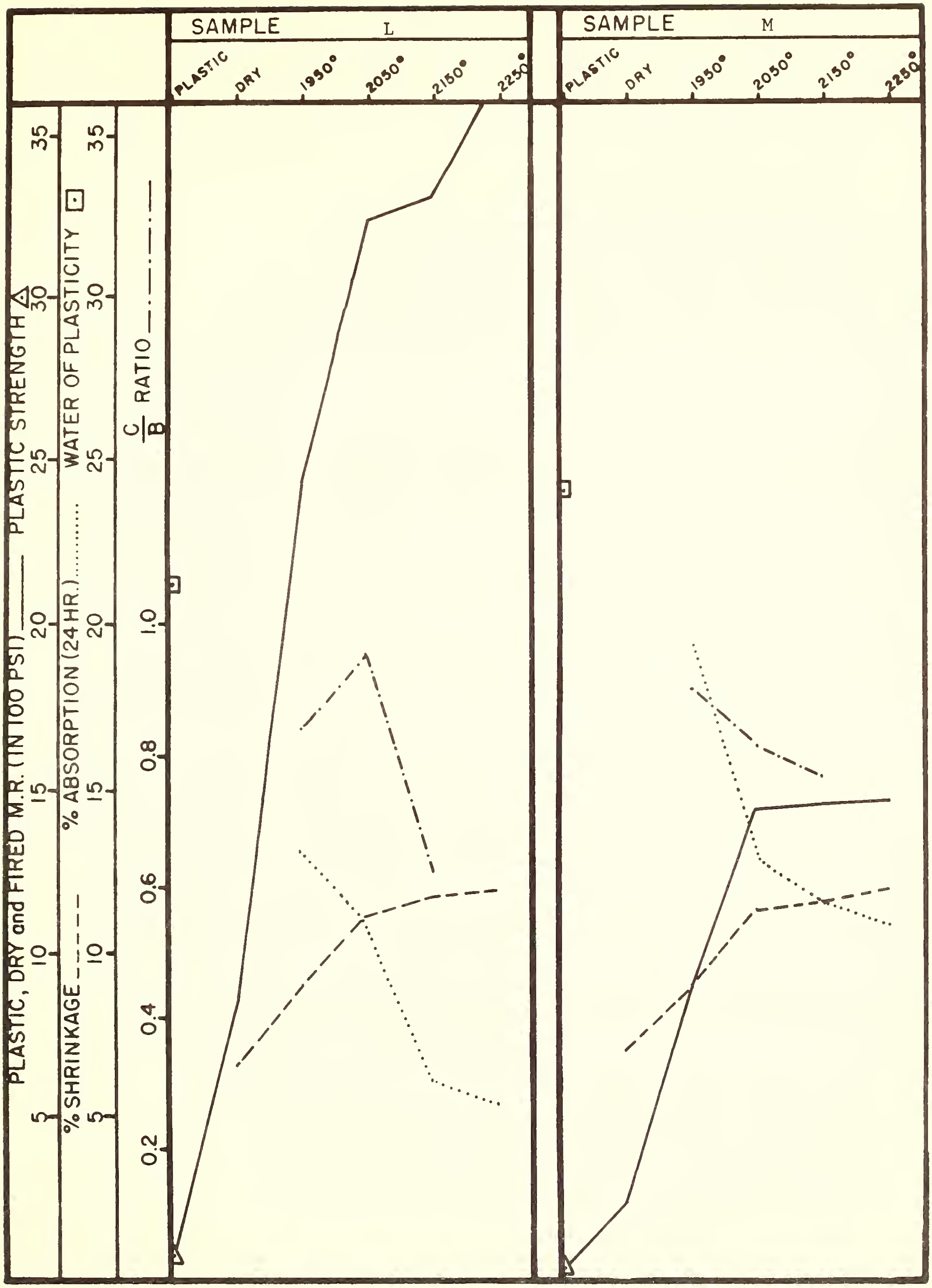
APPENDIX 3, GRAPHS OF CLAY PROPERTIES AT VARIOUS TEMPERATURES



APPENDIX 3, GRAPHS OF CLAY PROPERTIES AT VARIOUS TEMPERATURES



APPENDIX 3, GRAPHS OF CLAY PROPERTIES AT VARIOUS TEMPERATURES



APPENDIX 3, GRAPHS OF CLAY PROPERTIES AT VARIOUS TEMPERATURES

APPENDIX 4

BRICK PLANT - EQUIPMENT AND BUILDINGS

ITEM

1 Hopper - 10' x 10' in pit - 12' deep with sump pump and 5' culvert. Tunnel on 20° slope to surface. 24" gate on hopper.

2 Apron feeder - 30" x 8', with varidrive.

3 Belt conveyor - 30" x 60' - series 6000 - 20°. Idlers-Loading class "B" speed 100 FPM - 8 hours per day. Operation - rated 80 tons per hour. Inclined on 20° rise, and fitted with a hopper type discharge chute and scrap iron trap.

4 Granulator - 34" x 16'.

5 Belt conveyor - 30" x 25' Idlers-loading class-fitted with hopper type receiving and discharge chutes.

6 Disintegrator - 24" on 5' x 5' Pit - 6' deep with drain to hopper pit and 5' culvert tunnel on 20° slope to surface.

7 Belt conveyor - 30" x 40'. Idlers-loading class-fitted with hopper type receiving and discharge, chutes.

8 Smooth rolls - 24" on 5' x 5' Pit-6' deep with drain to hopper pit and 5' culvert tunnel on 20° slope to surface.

9 Belt conveyor - 30" x 40'. Idlers-loading class-fitted with hopper type receiving chute.

10 Hopper 5' x 5' x 2' - with 24" discharge 60° sloping sides-self supporting - to receive from items 9 and 22.

11 Disintegrator - 24" on 5' x 5' Pit - 6' deep with drain to hopper pit and 5' culvert tunnel on 20° slope to surface.

12 Belt conveyor - 80" x 40'. Idlers-loading class-fitted with hopper type receiving chute.

13 Hopper 5' x 5' x 2' - with 24' discharge 60° sloping sides, self supporting - to receive chute.

14 Combination Machine - pugging and de-airing. 18" augers. Pug mill, 28' diam. x 12' long. 2 extra sets, brick dies.

ITEM

15 Cutter-brick or tile - 24 bricks/cut, 15 cuts/min. - 68 platens.

16 Off bearing belt conveyor - 24" x 50' - flat belt conveyor - series 5000 with varidrive.

17 Kilncars 320 - 8' x 8' - poured refractory top-2,000 brick load. Max. temp. 2300°F 36" track width.

18 Holding Room, size 170' x 500' x 10' clear height. Brick walls, 20 yr. Bonded comm. roof with 1" Insul, Eleven 10' x 10' double hung rubber doors, asphalt floor, lighting-flourescent, 15 foot candles. 20 roof mounted humidifiers. 8-2 therm per hr. gas fired unit heaters to maintain 90% humid. and 90°F utilizing waste heat from kilns.

19 Tunnel kiln-8'6" x 10 x 435, continuous type, Gas fired electronically controlled - 50,000 brick per day kiln output. @ 2300°F and leaving at 80°F.

20 Packaging and strapping machine - 36 jigs - 1 station - 20 second cycle, packaging 500 brick per package. With stand-by hand strapping machine for seconds.

21 Storage yard - 10,000 sq. ft. for 1,000,000 brick.

22 Waste return belt conveyor - 24' x 150'. Idlers - loading class - fitted with hopper type receiving and discharge chutes, in trench 3' x 3' x 100'. Another belt inclines from tunnel at 20° slope with chute to hopper #10.

23 Car type conveyor - with pusher dog attachment. Consisting of: 4650 linear feet double track 36", Rail center - 20# track, 19 turnouts - 7 chain conveyors and drivers.

24 Kiln bldg-size 25' x 500' x 16' clear height. Asbestos siding and roof. Asphalt floor 4-10' x 10' dbl hung rubber doors, lighting - flourescent-15 foot candles.

25 Office Bldg. 24' x 40' x 12' clear height. Concrete block walls, 20 yr. commercial roof, concrete and tile floor with toilet rooms, lunch room, lab and 3 offices, furniture, fixtures and gas fired condition-aire.

26 Dump truck - 3 1/2 cubic yards. Plus 2 sets tires.

27 End loader - 1 cubic yard plus 1 set tires.

ITEM

28 Fork trucks, 2 required.

29 Pallets - 100.

30 Water well - 6" x 50' pump-100 GPM. Tank - 5,000 gal.

31 Sewer - septic system.

32 Gas distribution.

33 1,000 KVA sub station motor control center.

34 Electrical distribution.

35 Yard lighting.

36 Plant fence and guard House.

37 Graveley Swiftamatic tractor - 3 required.

38 Property - 10 acres and site clearing.

39 Manufacturing buildings.

40 Maintenance tools, electrical repair tools, test equipment.

APPENDIX 4

PLANT COSTS
PRODUCTION TOOLS AND EQUIPMENT

ITEM	HORSEPOWER/ HOURS/DAYS	LABOR COST	MATERIAL COST
1	1- 8-365	$ 792	$ 1,827
2	10- 8-365	450	7,740
3	7- 8-260	990	6,480
4	150- 8-260	900	13,500
5	2- 8-260	720	4,500
6	50- 8-260	900	12,420
7	3- 8-260	810	5,400
8	75- 8-260	900	13,500
9	3- 8-260	810	5,400
10		180	450
11	50- 8-260	900	12,420
12	3- 8-260	810	5,400
13		180	450
14	300- 8-260	900	32,040
15	7 1/2- 8-260	900	12,960
16	3- 8-260	720	5,400
19	360-24-365	158,000	385,000
20	10- 8-260	11,970	23,780
22	5- 8-260	1,620	12,420
23		11,200	21,600
	4,349,400 HP/HRS	$ 199,652	$ 582,417

TOTAL $ 782,069

APPENDIX 4

PLANT COSTS
OTHER TOOLS AND EQUIPMENT

ITEM	HORSEPOWER/ HOURS/DAYS	LABOR COST	MATERIAL COST
17			$28,800
26			4,500
27			12,420
28			2,000
29			2,880
37			5,400
40			1,680
			$ 57,680
		TOTAL	$ 57,680

- -

PLANT COSTS
PROPERTY, BUILDINGS AND UTILITIES

ITEM	HORSEPOWER/ HOURS/DAYS	LABOR COST	MATERIAL COST
18	50-24-365	$117,000	$135,000
21		2,700	4,500
24	25-24-365	31,250	31,250
25	15- 8-360	3,780	5,220
30	5-24-365	180	1,350
31		270	450
32		2,700	4,500
33		2,520	14,400
34		2,700	4,500
35	5-10-365	225	225
36		900	2,160
38		3,000	5,000
39	5- 8-260	13,500	16,200
	764,650 HP/HRS	$180,725	$224,755
		TOTAL	$405,480

APPENDIX 4

SUPPLIES (ANNUAL)

Lubrication and Hand tools	
1% of production tools and equipment	$ 5,824.17
3% of other tools and equipment	1,730.40
Maintenance and spare parts	
5% of materials costs	43,242.60
Office supplies	
6% of total labor	13,672.61
Gas, oil and maintenance for trucks fork lifts etc., estimated at $60.00/month. 60 x 7 x 12	5,040.00
	$68,509.72

WORKING CAPITAL
2 MONTHS

Materials	$15,866.66
Productive Labor	29,337.80
Non-productive Labor, power, water, fuel, supplies, telephone, inventory	79,677.24
Reserve for sales collection	
1/2% of annual sales	823.58
	$125,705.28

APPENDIX 4

DEPRECIATION SCHEDULE

ITEM	YEARS	TOTAL COST	ANNUAL COST
Production tools and equipment	25	$782,069	$31,303.16
Other tools and equipment:			
17	6 1/4	$ 28,800	$ 4,608.00
26	6 1/4	4,500	720.00
27	8 1/3	12,420	1,481.00
28	8 1/3	2,000	240.10
29	2 1/2	2,880	1,152.00
37	5	5,400	1,170.00
40	5	1,680	336.00
Buildings and property (less furniture and fixtures)	25	$401,880	$16,075.20
Furniture and fixtures	8 1/3	3,600	432.18
TOTAL ANNUAL DEPRECIATION			$57,517.64

APPENDIX 5

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APPENDIX 6

BIBLIOGRAPHY

George Aase & Associates, Inc., 1962, Feasibility study of a proposed Portland cement industry in Redevelopment Area A, west Florida: Consultants report for Area Redevelopment Administration, U. S. Department of Commerce, published by Florida Development Commission, Tallahassee, Florida.

Bell, Olin G., 1924, A Preliminary Report on the Clays of Florida: Tallahassee, Florida Geological Survey, Fifteenth Annual Report.

Brick and Clay Record, Various Issues, Published Monthly: Chicago, Cahners Publishing Company.

Buie, B. F., 1957, Interim report on investigations of clay near Blountstown, Florida: unpublished consultant's report.

Calver, James L., 1949, Florida kaolins and clays: Florida Geological Survey, Information Circular No. 2.

Cavallaro, I.L., 1961, A Study of Marketing and Other Factors in Establishing a Brick Manufacturing Plant in Florida's Big Bend Area: Tallahassee, Florida State University, Unpublished M. S. Graduate Study.

Greaves-Walker, A. F., et al, 1949, The Development of a Structural Clay Products Industry Using Florida Clays: Gainesville, University of Florida, Engineering and Industrial Experiment Station Bulletin No. 30.

Greaves-Walker, A. F., et al, 1951, The Development of Lightweight Aggregate from Florida Clays: Gainesville, University of Florida, Engineering and Industrial Experiment Station, Bulletin No. 46.

Lang, W. B., et al, 1940, Clay investigation in the southern states, 1934-35: U. S. Geological Survey Bulletin 901.

Plummer, Harry, C., 1962, Brick and Tile Engineering: Washington, D. C., Structural Clay Products Institute.

Structural Clay Products Institute, 1960, Principles of Clay Masonry Construction: Washington, D.C., Structural Clay Products Institute.

Structural Clay Products Institute, 1961, Pocket Guide-Brick and Tile Construction: Washington, D.C., Structural Clay Products Institute.

Structural Clay Products Institute, 1962, The Structural Clay Products Industry Today and Tomorrow: Washington, D.C., Structural Clay Products Institute.

U. S. Bureau of Census, 1953-1962, Current Industrial Reports: Series: M32D, Washington, D.C., U. S. Department of Commerce.

U. S. Bureau of Census, 1962, Exports Annual: Washington, D.C., U. S. Department of Commerce.

U. S. Bureau of Census, 1962, Imports Annual: Washington, D.C., U. S. Department of Commerce.

U. S. Department of Commerce, 1953-1963, Statistical Abstract of the United States: Washington, D.C., U. S. Government Printing Office.

U. S. Bureau of Mines, 1954-1962, Minerals Yearbook: Washington, D.C., U. S. Government Printing Office.